BRITISH COLUMBIA

**Ministry of Environment, Lands and Parks**

**Ministry of Forests**

# RESOURCE MANAGEMENT PLAN
# FOR THE
# KOOTENAY BOUNDARY REGION
## 2001 - 2005

1.0 INTRODUCTION ........ 1

2.0 PURPOSE ........ 1

3.0 PROCESS AND PROCEDURES ........ 1

4.0 RESOURCE AND INVESTMENT PRINCIPLES ........ 2

5.0 PROGRAM STRATEGIC OBJECTIVES ........ 3

SUSTAINABLE HARVEST ........ 3

FOREST RESOURCES INVENTORIES ........ 4

6.0 SUSTAINABLE HARVEST ........ 4

6.1 Introduction ........ 4
6.2 Priority Identification and Ranking ........ 4
6.3 Activity Needs and Allocation Recommendation Process ........ 5

SUSTAINABLE HARVEST FUNDING RECOMMENDATION SUMMARY FOR 2001/02 ........ 7

TOTAL ........ 7

7.0 ENHANCING ENVIRONMENTAL VALUES ........ 7

7.1 Introduction ........ 7
7.2 Process ........ 8

8.0 STRENGTHENING SUSTAINABLE FOREST MANAGEMENT ........ 10

*8.1 Introduction ........ 10*
*8.2 Process ........ 10*
*8.4 Results ........ 12*

9.0 RESEARCH ........ 13

10.0 CURRENT REFORESTATION ........ 13

11.0 FOREST HEALTH MAINTENANCE ........ 13

12.0 FOREST RECREATION ........ 17

13.0 WATERSHED RESTORATION (NON FRBC PRIORITY) ........ 19

14.0 BRIDGE REPLACEMENT ........ 20

15.0 ROAD AND BRIDGE MAINTENANCE ........ 20

16.0 HABITAT ENHANCEMENT THROUGH SILVICULTURE ........ 22

16.1 Purpose ........ 22
16.2 The Process Of Setting Program And Project Priorities ........ 23
16.3 Knowledge Gaps And Funding Needs ........ 24
16.4 Additional Funding Considerations ........ 25
16.5 Sustainable Harvest Program Strategy For Delivery ........ 25
16.6 MELP Habitat Enhancement Priorities – Sustainable Harvest Program ........ 26

17.0 FOREST RESOURCES INVENTORY ........ 28

## 1.0 INTRODUCTION

The Ministry of Forests (MoF) and Ministry of Environment, Lands and Parks (MELP) are mandated by legislation to undertake planning functions related to the management of Crown forest land. The executives of both ministries have directed ministry staff to implement resource management planning to identify forest resource management needs and priorities.
As part of the Services Agreement with Forest Renewal BC (FRBC), MoF and MELP will "recommend conservation and stewardship investment opportunities in support of Forest Renewal's Strategic Objectives". These recommended opportunities are a product of the ministry Resource Management Plan (RMP).

## 2.0 PURPOSE

The purpose of the RMP is to:

- Identify MoF and MELP forest management resource objectives and priorities;
- Recommend investment opportunities in support of FRBC strategic objectives;
- Identify funding requirements for ministries' objectives and resource priorities not eligible for FRBC funding.

The RMP is a compendium of all resource management objectives and priorities, determined by the MoF, MELP , forest licensees, TFL holders and other stakeholders that provide the basis for funding agency investment decisions. The ministry RMP is directed at linking resource management objectives from higher level planning to "on the ground" accomplishments. The RMP recommendations are anticipated to form the core component of the FRBC Forest and Environment Investment Plan (FEIP). The FEIP is a component of FRBC's overall Regional Investment Plan (RIP) which will be submitted to the Forest Renewal Board of Directors in December 2000 for approval. FRBC will then proceed to establish which proponents will deliver the approved priority projects, and set multi-year and annual investment and employment allocations.

## 3.0 PROCESS AND PROCEDURES

The RMP development was lead by MoF/MELP in cooperation with licensees and other directly affected stakeholders. For the FRBC strategic objectives of Sustainable Harvest (SH), Enhancing Environmental Values (EEV) and Strengthening Sustainable Forest Management (SSFM) steering or planning committees were established (Appendix 1) to guide the ministries in the RMP development, in addition to providing feedback and recommendations to FRBC. The FRBC eligible activity priorities, ranking and final recommendations were based upon the FRBC strategic objectives and their key targets and performance measures.
The resource planning for SH was conducted at the Timber Supply Area (TSA) and Tree Farm License (TFL) management unit level, whereas, the EEV and SSFM planning was conducted at the FRBC regional level.
RMP development was guided by the "Guidelines for the Development of Resource Management Plans for 2001/02" (http://www.for.gov.bc.ca/cpp/rmpguidelines/guidelines.htm). From this

base, regional guidelines, as guided by FRBC ground rules (Appendix 2) were developed, as deemed necessary, within the terms of reference of the various steering committees.

Non FRBC eligible programs and activities have also been collated at the regional level to identify additional priority investment opportunities and critical works that need to be carried out in 2001/02.

## 4.0 RESOURCE AND INVESTMENT PRINCIPLES

Planning for ministries program activities and FRBC land based strategic objectives are consistent with the purposes and functions of the MoF. These include:

- encourage maximum productivity of the forest and range resources in BC;
- manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on BC;
- plan the use of forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and resource values are co-ordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;
- encourage a vigorous, efficient and world competitive timber processing industry in BC;
- assert the financial interest of the government in its forest and range resources in systematic and equitable manner.

Planning was also consistent with the purposes and functions of the Ministry of Environment Act. These include:

- to encourage and maintain an optimum quality environment through specific objectives for the management and protection of land, water, air and living resources of BC;
- to undertake inventories and to plan for and assist in planning , as required, for the effective management, protection and conservation of all water, land, air plant life and animal life;
- to manage, protect and conserve all water, land, air, plant life and animal life, having regard to the economic and social benefits they may confer on BC.

In addition and/or more specifically, resource management plan investment recommendations are:

- consistent with present legislation, policies and the Kootenay Boundary Land Use Plan;
- address continuing program commitments and links to other plans and agreements;
- maintain current and reliable inventories and other components of the corporate data base which are the basis for land based investment decisions;
- directed towards those conditions, stands and treatments which are cost effective and minimize risk;
- ensure timber supply implications are considered and maximized without detriment to other resource values;
- consider non-timber resource values and stakeholders.

FRBC investment principles have been established to guide ministry planning within their Environment and Land and Resources investment areas. These include:

- Forest Renewal's highest priority for distribution of investment funds is allocation to business areas, programs and activities based on the potential contribution toward achieving Corporate Strategic Objectives at reasonable cost.
- The proportion of total funding flowing to investments managed through partnership arrangements is to be maintained at current levels.
- The RMP and FEIP planning processes must be transparent.
- Planning process outputs will be determined as program level investment strategies.
- The MoF and MELP will ensure that individual land-based investments can be explained and defended in terms of their potential for return on investment and value-for-dollar.
- The total annual employment created through investments is expected to be proportional to that created in previous years.

## 5.0 PROGRAM STRATEGIC OBJECTIVES

FRBC has provided the following strategic objectives and investment strategies by program area:

Sustainable HarvestFocus on long-term investments to increase the volume, value and health of second-growth forests.

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Enhance Environmental ValuesFocus on restoration and protection of fish habitat and domestic water supplies in priority watersheds, which have been damaged or are threatened by pre-code forest development.

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**Strengthen Sustainable Forest Management (Enhance Knowledge)**
Focus on increasing knowledge, techniques and innovations to strategically manage forest according to principles of sustainable forest management.

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In addition, the following regional program strategies attempt to provide a uniform set of objectives intended to guide program investment needs not eligible for FRBC funding. The individual strategies, tactics, and activity investments within the programs should all be directed towards achieving these objectives.

### Current Reforestation

To establish free growing stands on areas deforested from October 1, 1987 to present which have not been salvage harvested (Fire and Pest deforestation) and are exempt from legislative requirements of the Forest Practices Code Act.

### Forest Health Maintenance

To promote or improve the health, vigor and minimize wood supply losses due to insects and disease.

**Forest Recreation**
To manage forest recreational activities consistent with user demands, safety considerations and site protection while reducing conflicts with other resource uses.

**Watershed Restoration (non FRBC priority)**
To mitigate existing forest resource impacts and reduce the risk of future potential impacts caused by past forest harvesting practices and roads on non status roads required to provide for public safety, protect private property or other improvements (highways, utilities etc) where the risk is high.

**Road and Bridge Maintenance**
To provide safe, convenient and unhindered access through the Forest Service Road network for the public, industry and other stakeholders.

**Bridge Replacement**
To ensure that all Forest Service Road Bridges are replaced consistent with fibre flow requirements, environmental impacts and user safety.

**Habitat Enhancement**
To identify habitat enhancement projects that can be implemented concurrently with Sustainable Harvest silviculture activities.

**Forest Resources Inventories**
Focus on the capture of those inventories that are a resource management need, and do not meet FRBC's eligibility requirements.

## 6.0 SUSTAINABLE HARVEST

### 6.1 Introduction

The Sustainable Harvest component of the RMP is based upon individual management unit submissions which were guided by their strategic silviculture investment priorities as well as FRBC performance measures and targets. In recognition of historic allocations conflicting with regional and management unit priority needs, FRBC provided guidance to allow for 20% of the historic funding levels (as per last year) to be targeted by the steering committee based on regional priorities. The Steering Committee, comprised of MoF, MELP and industry, guided the development process and determined the final investment recommendations.

### 6.2 Priority Identification and Ranking

The Sustainable Harvest resource planning was conducted at the TSA and TFL level between November 1998 and August 2000. Strategic silviculture planning workshops were held for each of the Nelson Forest Regions TSAs in addition to TFLs 3, 8, 14 and 23. Funding shortages and operational constraints have not allowed for all TFLs to be addressed to date..

The strategic silviculture workshops have been based upon the provincial standard originally developed by LP Atherton and Associates and Cortex Consultants Ltd. to identify incremental silviculture priorities. The process used in the Nelson Forest Region expanded the original scope to also include basic silviculture activities (non FRBC eligible) as well wildlife habitat issues with the input from MELP staff. Participation at the workshops included MoF and Licensees with MELP and FRBC staff attending , when available.

TFLs, on which strategic planning workshops were not completed, based their RMP submissions on local knowledge and historical silviculture treatment priorities.

Detailed management unit silviculture strategy reports may be found in Appendix 3 a).

The future direction for the Nelson Forest Region, is to complete the analysis on the remaining TFLs, not yet addressed, and conduct detailed analysis and modelling of different levels of silviculture and other management practices on wood flow, wood quality and habitat supply. This detailed analysis should be conducted for each management unit upon completion of their TSR. The analysis would guide the direction of the silviculture program until the next TSR or when major management objective changes occur. This process should also allow for a comparative analysis between management unit priorities.

### 6.3 Activity Needs and Allocation Recommendation Process

The individual management units were provided funding targets upon which to base their initial draft RMP submissions. Investment recommendations, at 80% and 120% of targeted funding allotments, were to be based upon completed silviculture investment strategies, SH strategic objective guidelines and completed in co-operation with major licensees.. Submissions were summarized and submitted to the regional Sustainable Harvest Steering Committee for review and consideration in making investment recommendations for2001/02.

The investment recommendation process used was intended to facilitate the transition from historical funding allocation processes to one based on regional and management unit priorities The following are the principles used by the management units and Steering Committee to prepare the RMP investment recommendations.

**FRBC Strategic Objective Targets and Principles:**

- Increase available timber for future harvest by 1.5M $m^3$. Priority given to short term benefits.
- Increase the economic value of timber on all enhanced forestry treatment areas by 5-30%. Regional target set by FRBC is 5 %. The basis for achievement of this target is still to be determined.
- 2150 ha added back to the commercial forest base through surveys and planting.

- 6250 ha of previously planted land will be brought to free growing status. (primarily brushing on commenced upon backlog NSR prescriptions)

- The focus of the process is on positive changes for the planning unit as a whole.

- Investment decisions are to be guided by stewardship plans and priorities for each management unit.

- Planned activities must have reasonable cost estimates within regionally relevant cost guidelines.

- The management unit base funding commitment is to be no less than 80% of the initial approved budget allocation.

- Additional funding investment decisions will be guided by investment principles established by the Steering Committee and achievement of FRBC's strategic investment targets.

**Steering Committee Principles and Process:**

- Management units will be assured a minimum base funding level of 80% of their historic funding level, as provided by FRBC. This 80% funding commitment is dedicated for investments within the management unit (TSA or TFL). The minimum 80% management unit allocation will be comprised of entrenched costs tied to the management unit plus additional activity funding required to bring the management unit up to the 80% commitment level. The remaining 20% funding is pooled and available for investment recommendations by the Steering Committee to meet any outstanding priority needs.

- The first priority is to fully fund entrenched costs associated with commenced-upon backlog prescriptions and any multiyear project contractual commitments which require ongoing funding to produce a useable product (eg. a silviculture study spanning 2 years but not to complete spacing which may be curtailed by snow

- Second priority is to address achievement of regional FRBC performance measure targets and the provincial SH target of by March 2002, for backlog sites;

a) accurately identify and categorize all stands as NSR, SR or NP.
b) Put under prescription all NSR sites that will be treated to bring them to SR.

**Steering Committee Investment Recommendations:**

Minimum investment recommendations for 2001/02, by program, have been summarized for the region in the following table.

**Sustainable Harvest Funding Recommendation Summary for 2001/02**

| Program | TSA ($) | TFL ($) | Total ($) |
|---|---|---|---|
| Backlog | 3,360,222 | 1,150,509 | 4,585,970 |
| Forest Health Enhancement | 0 | 8,000 | 8,000 |
| Stand Tending | 717003 | 464,355 | 1,181,358 |
| Habitat Supply | 0 | 0 | 0 |
| **Total** | 4,077,225 | 1,622,864 | 5,775,328 |

Detailed activity summaries and individual management unit recommendations may be found in Appendix 3 b).

## 7.0 ENHANCING ENVIRONMENTAL VALUES

### 7.1 Introduction

In 1999, FRBC refocused the Watershed Restoration Program in view of achieving their strategic objective of Enhancing Environmental Values [EEV]. While the program has been in a transition phase over the last year, future investment by FRBC will be targeted to restoring and protecting fish habitat and domestic water supplies in priority watersheds, which have been damaged or are threatened by pre-Code forest development. All components of watershed restoration in key watersheds, e.g., upslope, riparian, and stream work required to restore or protect fish habitat and water supplies will be integrated in a holistic manner in view of achieving this goal.

The performance measures in relation to the new program vision, goals and strategies are to complete restoration in 20% of the highest priority watersheds in each region which have been damaged or seriously threatened by past forest development activities, and to implement effective monitoring and evaluation that focuses on restoration goals of the key watersheds.

In July 1999, an EEV regional steering committee comprised of Industry, FRBC, MoF and MELP was formed to guide the ministries in the development of the RMP. The steering committee was reconstituted in July 2000 to proceed to the next 2 phases of the development of the EEV strategic plan. The RMP exercise was conducted primarily at a regional level with input from MoF, MELP, and industry at the district level. RMP planning process followed the EEV RMP provincial guidelines "RMP - Guidelines for the Enhancing Environmental Values Component" which can be found on this web site: http://www.for.gov.bc.ca/CPP/rmpguidelines/index.htm.

Other considerations were to:

- identify key watersheds in relation to specific criteria at a regional level;
- utilize existing assessments and knowledge;
- focus on 'at risk' but functioning watersheds;

- focus on watersheds where past forest development is the main problem (i.e., non-forestry land uses are not significant problems);
- focus on watersheds with a good chance of restoration success;
- use higher level plans to guide the selection;
- limit the criteria used to establish watershed priorities.

The intent of the RMP will be not only to guide future FRBC investment, but also to serve as an aid for other agency and community restoration efforts.

### 7.2 Process

The process consisted of a series of steps as follows:

Step 1: Identification of fish species and or special stocks of concern in each region.
MELP fisheries staff identified fish species and stocks of concerns, focusing primarily on threatened, endangered and vulnerable stocks. Locations of species and stocks of concern were provided along with a rationale for their identification. This information is presented in Appendix 4 a) in database report "Fish Species/Stocks of Concern in the Kootenay Region".

Step 2: Creation of a base map showing watershed units for the region.
RMP guidelines suggested a workable size of watershed unit for efficient analysis and prioritization would range from 30,000 to 75,000 hectares. This direction was applied by and large for grouping watersheds and/or selecting 3rd and 4th order watershed as "watershed units". An effort was made to group watersheds in a logical and consistent manner based on similarity of geophysical attributes and compatibility of values. Each watershed unit was assigned a GIS tag for easy identification and database manipulation. The delineation of watershed units can be seen on the GIS map in Appendix 4 b). There are a total of 287 watershed units in this region.

Step 3: Selection of watersheds that are important producers or conservation streams for the identified target species and or stocks and identification of consumptive water supply watersheds.
District MoF and MELP staff provided information on fisheries and consumptive water use for each watershed unit.

Step 4: Ranking by category, (e.g., Very High, High, Medium) the list of domestic watersheds and target fish-bearing watersheds.
A ranking scheme was adopted to prioritize, as a first cut, all watershed units. Fisheries values were ranked from moderate, where no species and stocks of concern were present, to very high -1 where threatened species and stocks were identified and which contributed to a significant fishery. Similarly, consumptive water use was ranked from very high for FPC community watersheds, to low where there was no consumptive use. The full ranking scheme for fish and water use is found in Appendix 4 c) in database reports "Water Ranking Descriptions" and "Fish Ranking Descriptions".

Step 5: Estimate of the status of impact and potential for restoration for each of the ranked watersheds.
District MoF and MELP staff determined the status of impact of each watershed unit based on the following categories:

Category I - Watersheds that have known impacts from past pre-Code forestry that will potentially benefit from restoration activities
Category II – Watersheds with significant impacts from other land use (or private land development) that will potentially benefit from restoration activities
Category III – Watersheds with minimal or no forestry-related impairment of fish habitat or water quality
Category IV – Watersheds known to be impacted to such an extent that restoration effort is unlikely to be successful
Category V – Watersheds with insufficient data to make a determination
Category VI – Watersheds with significant restoration investment

A preliminary list of all known WRP activities to date in each watershed unit was also entered into the database. A summary of the status of watershed units in the region is found in Appendix 4 d) "Table 2 - Summary of Regional Priority Setting Product"

Step 6: Compilation and Analysis of information.
All information compiled from the above 5 steps were entered into the database. The outcome is presented "EEV-RMP Mandatory Data Report" which can be obtained from MELP and accessed through their FTP web site.

Step 7: Selection of Target Watershed Units
In order to meet the performance measure identified by FRBC for the Enhancing Environmental Values" strategic objective, 20 % of the highest priority watersheds were selected as funding priorities. These watersheds were primarily selected by the MYA holders based on their review of high priority watersheds within their operating area. 28 watershed units are recommended and are listed in Appendix 4 e) Table 3 a) - "Minimum Data Requirements for Watershed Units". The intent was to provide flexibility to FRBC and industry in identifying watersheds which also met their needs, be they social, economic, operational, equitable or others, which may be different than those enunciated in the strategic objective.

Step 8: Preliminary
Licensees were asked to provide preliminary restoration plans for target watersheds within their chart area to give an indication of the approximate level of funding over the next 3 years for assessment, prescriptions, works and monitoring. This information can then be compiled to allow FRBC and the ministries to ascertain whether the performance measure for the EEV strategic objective will likely be met with the current levels of funding. A summary of this information is found in Appendix 4 e) " Table 3 b): Regional Summary of Preliminary Restoration Plans". The individual interim restoration plans are located in appendix 4 f).

It should be noted that some plans are yet to be added to the RMP while most plans require refinement to ensure that all aspects of restoration are captured in order for a watershed to be completed. This exercize is expected to occur during the fall

## 8.0 STRENGTHENING SUSTAINABLE FOREST MANAGEMENT

### 8.1 Introduction

Similar to 1999, a regional planning team was established in June 2000 to develop the Strengthening Sustainable Forest Management (SSFM) component of the Resource Management Plan for the Kootenay/Boundary region. The planning team was comprised of representatives from Ministry of Forests, Ministry of Environment, Lands and Parks, Kootenay/Boundary Inter-Agency Management Committee, Southern Interior Forest Extension & Research Program, Forest Renewal British Columbia (FRBC), Arrow Forest District Innovative Forest Practices Agreement, environmental community and forest industry. A consultant was hired to facilitate the process and report results. The participants of the Kootenay/Boundary Regional SSFM Planning Team are listed in Appendix 1.

The overall SSFM process was guided by the *Resource Management Plan for Strengthening Sustainable Forest Management (SSFM) Guidelines*[1]. Forest Renewal's SSFM strategic objective is specifically focused on increasing ***knowledge, techniques*** and ***innovations*** to strategically manage forest resources according to principles of sustainable forest management. This new direction signifies a shift in focus from operational level inventory to higher level strategic decisions and planning processes. It also reflects an increased emphasis on funding of activities/strategies to enhance the use of existing information. Inventory will continue to be eligible for funding, however, the inventory will be required to address strategic resource plans and processes (*e.g.*, regional, sub-regional and forest and landscape level plans and decisions including timber supply reviews).

### 8.2 Process

The overall process used to identify the key regional SSFM issues essentially followed the 2000 provincial planning model draft and included:

Phase 1: Establishment a ***Regional Planning Team*** and hiring of a ***project co-ordinator***.

The technical and management level representation on the Kootenay/Boundary Regional Planning Team combined the regional and management level planning teams identified in the provincial process. This was considered an effective and efficient approach to providing both the strategic direction and technical support needed for completion of the overall SSFM planning process.

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[1] Husted, L., and C. Alexander. 2000. Resource Management Plan for Strengthening Sustainable Forest Management – Guidelines. Working Draft. Forest Renewal B.C., Victoria, B.C.

Phase 2: Identification of ***key regional SSFM issues***.

This macro-level identification of strategic issues and knowledge needs by the regional planning team was 'kick started' through a review of the previous year's SSFM component of the Resource Management Plan[2]. The 1999 list of projects was reviewed within the context of the year 2000 FRBC shift in focus from operational to higher-level strategic decisions and planning processes as outlined in the May 2000 SSFM provincial guidelines. Eligible projects from the previous year were carried forward for consideration and evaluation for this reporting period. The planning team subsequently identified a preliminary list of key regional SSFM strategic issues for further evaluation.

The 1999 list of Ministry of Forests and Ministry of Environment, Lands and Parks SSFM key projects, including the three tiered project rankings, is provided for reference in Appendix 5 a). Additional information on the regional (Castlegar) and provincial (Vernon) meetings of the Southern Interior Forest Extension & Research Program, also a contributory participant of the SSFM regional planning team, can be found at website http://www.siferp.org.

Phase 3: Development of ***knowledge strategies*** for each key regional SSFM issue.

The regional planning team identified potential activities and/or strategies, including specific projects, for each key SSFM strategic issue identified in Phase 2. Brief issue summary reports (1-2 pages) were developed for each key issue to define:

- the *critical elements* and *scope*;
- *knowledge needs or gaps* in use of existing information;
- *activities, strategies* and/or new *information needs* (*e.g.*, applications research, extension/communication, tools/frameworks/processes, inventory or analysis, and/or, research);
- *cost estimate*; and,
- *performance indicators* for each key issue.

The issues summary report are contained in Appendix 5 b)

Evaluation criteria were also developed to assess and rank projects. These included:

- *urgency* (timeframes around higher level plan and timber supply review);
- *benefits* (sustainability, reduction in risk/uncertainty, scope of benefits, short/long term);
- *cost* (investment to date, required funding); and.
- *probability of success* (timing, complexity, expertise required, obstacles or alternative approaches).

An example of the ranking matrix is provided in appendix 5 c)

A regional stakeholder review of key SSFM strategic issues and evaluation criteria was conducted. The results, were collated, evaluated and reported by the SSFM regional planning team) with the summarized review comments to be found in Appendix 5 d).

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[2] Ministry of Forests and Ministry of Environment, Lands and Parks. 1999. Resource Management Plan for the Kootenay Boundary Region. FRBC Report.

Phase 4: ***Recommendations for regional investments*** for SSFM.

The regional planning team identified a list of high, medium and low regional SSFM strategic issues based on procedures and evaluation criteria outlined above. The project ranking results are listed below and further detailed in a table summary format in the Results section that follows.

| *HIGH* PRIORITY REGIONAL SSFM ISSUES | *MEDIUM* PRIORITY REGIONAL SSFM ISSUES | *LOW* PRIORITY REGIONAL SSFM ISSUES |
|---|---|---|
| Spatial Analysis Project | Maintaining Sufficient Old and Mature Forest within the Landscape | TSR Inputs for Operability Limits |
| Landscape Unit Planning for Old and Mature Forests | Site Series and Predictive Ecosystem Mapping (PEM) | TSR Inputs for Operational Adjustment Factors (OAF) |
| Structural Attribute Definitions for Old and Mature Forests | Fisheries Inventory | |
| Mountain Caribou | TSR Inputs for Unstable Terrain | |
| Ungulate Winter Range | TSR and Partial Cutting | |
| Maintaining Water Quality, Quantity and Timing of Flow | Rare and Endangered Species | |
| | Grizzly Bears | |
| | LUP Analytical Tools | |

### 8.4 Results

The provincial SSFM guideline document provides a Sample Project Summary Table for projects which are assumed: (a) to be eligible for FRBC funding, (b) to be relevant to addressing key issues (*as identified by the regional planning team*), (c) to have a high likelihood of success and (d) to be supported by a clear rationale[1]. This sample summary table provided the format for the regional planning team to report and detail the priority strategic SSFM issues and associated strategies/activities resulting from completion of Phases 1 through 4 as identified above. The HIGH and MEDIUM ranked priorities are detailed in the project summary tables that may be found in Appendix 5 e). The LOW priority issues are listed for reference only – based on the assumption that the high and medium priority funding requirements will likely exceed FRBC funding allocation for this year. The low priority issues are nonetheless outlined in the brief issue summary reports prepared as part of Phase III.

## 9.0 RESEARCH

The Southern Interior Forest Extension and Research Partnership (SIFERP) has initiated a series of workshops, from June – August, 2000, to gather key natural resource management knowledge gaps to the development of a provincial strategy. The intent is for this strategy to be used by FRBC to direct future investments in research, development and extension.
This needs analysis approach, specific to Research, took place concurrently to the RMP development, which was also intended to act as a source document to identify research needs and priorities within the region. Time did not allow for a clean integration of the two processes, however, the key issues, knowledge gaps and priorities have been adequately identified within the aforementioned SIFERP process.
The BC Knowledge Gaps Database (Version 1) produced by SIFERP can be accessed at http://www.siferp.org/frbcstrat/links.asp

## 10.0 CURRENT REFORESTATION

The strategic objective of the Current Reforestation program is:

***"To ensure that all fire and pest areas are regenerated and tended to achieve free growing stands."***

For areas denuded by fire or pest and where no salvage harvesting has occurred, the district manager has an obligation to reforest. This legal obligation creates a high priority for treatment. Regeneration and free growing time frames on many areas would not be met without carrying out basic silviculture activities, including surveys, site preparation, planting, brushing and maximum density spacing.

Summary table containing regional needs for 2001/02 may be found in Appendix 6.

## 11.0 FOREST HEALTH MAINTENANCE

The strategic objective of the Forest Health Maintenance Program is:

***"To promote or improve the health, vigor and minimize wood supply losses due to insects and disease."***

The following are activity descriptions and tactics required to achieve the above strategic objective:

**Forest Health Planning.**
Planning with the objective of minimizing pest impacts and maximizing opportunities for pest control is critical to any forest land management activity. No stand treatments or activities should take place before they are evaluated and prioritized. This ensures the proper allocation of financial and natural resources and the maximization of benefit. All high hazard stands should be monitored annually for pest activity and plans should be formulated to deal with pest

outbreaks. Plans should be made for the entire land base and updated annually with each overview survey.

**Operational Trials and Research**

Operational trials and research provide the necessary information to evaluate and improve forest management practices. These activities monitor results of treatments applied to the forest land base and provide input on how to modify or improve practices. Only continuing research will provide us with information on how to improve detection techniques, develop new methods of hazard and risk rating, provide new methods for managing forest health agents and provide managers with new tools for planning and regenerating the forest resource. There must be a constant level of research conducted in the region in order to advance our management techniques and expertise.

**Landscape Level Forest Health Monitoring - Annual Aerial Overview Surveys**

Without this critical activity, there will be no record of the extent and severity of forest pests and the Chief Forester would not be able to meet obligations under the Forest and Ministry of Forests acts. Many forest health activities are reliant upon the information gathered during this annual aerial overview survey. The entire region should be surveyed annually and complimentary ground based monitoring should also be delivered. The minimum delivery level is as described above, and is dependent upon pest population levels and management goals for the forest land base. The optimal delivery level would be to survey all Crown forest (working forest).

**Landscape Level Forest Health Monitoring - Population And Damage Prediction For Defoliating Insects**

For defoliators, all high hazard areas should be monitored (pheromone trapping, egg sampling and 3-tree beating surveys) annually. Baseline effort is to sample high hazard stands based upon historic areas of defoliation and results of annual aerial overview surveys. In addition to high hazard stands, stands receiving enhanced silviculture treatments should be monitored on an ongoing basis to minimize potential damage from defoliating insects. Population monitoring should be conducted annually, even in "non-outbreak" years.

**Detailed Annual Operational Air Surveys**

Detailed air surveying and mapping forms the "backbone" of the district forest health program to which all other forest health operational activities (treatments) and tracking systems are tied. As a result, detailed air surveying is an ongoing operational activity that is to be conducted each year to maximize the effectiveness of a district forest health program. All high priority areas within the districts are surveyed annually since tracking of current and new forest pest populations in these areas is critical. Lower priority areas where forest pest populations appear static, ideally, are also surveyed annually, but may be surveyed up to every two years. Note that in dealing with the complex biology and behaviour of forest pests, low priority areas may become high priority areas unexpectedly, in a short period of time. This underlies the importance of an effective annual operational air survey covering the entire land base.

**Hazard And Risk Rating**

Hazard and Risk Rating Analysis for Forest Health Factors are predictive tools that provide forest managers with a framework within which they can plan and prioritize their stand management activities. The information provided through these analyses should be incorporated into both

Strategic and Operational planning processes so that the impact or potential impact of Forest Health Factors on Management Objectives can be considered. Hazard and risk rating should be done for all major bark beetles, defoliators, terminal weevils and root diseases. This process once done need only be updated on a 5-year interval or as new information is brought forward. These hazard and risk maps are integral to forest planning.

**Ground Surveys For Pest Incidence, Including Root Disease Surveys**
To determine the incidence and severity of damaging agents and obtain basic stand and site information, and decide on courses of action for pest management. The surveys can also be used to monitor efficacy of treatments to managed stands, and to determine background levels of pest incidence for landscape level planning.

**Fall And Burn Treatment For Mountain Pine Beetle**
Post-attack fall and burn treatments are conducted to decrease populations of mountain pine beetle (MPB) which are inaccessible or outside of approved cutting permits and will not likely be addressed by harvesting within the next 2 year time frame. These treatments reduce unsalvaged losses by decreasing attack and mortality caused by the mountain pine beetle. All increasing populations of MPB and inaccessible areas where MPB has been detected should be treated to decrease populations. Without these treatments, MPB populations will increase, and large areas of pine will be killed.

**Post Attack MSMA For Mountain Pine Beetle Or Lethal Trap Trees Pre-Attack MSMA Treatment For Spruce Beetle**
Pre-attack MSMA treatment is conducted to decrease populations of spruce bark beetle (SBB) that are inaccessible or outside of approved cutting permits and will not be addressed by harvesting within the next 2 year time frame. MSMA treatments will reduce unsalvaged losses by decreasing attack and mortality caused by the spruce bark beetle and will contain populations within identified areas, minimizing spread to surrounding high hazard stands.
MSMA treatments are conducted to decrease populations of mountain pine beetle which are inaccessible or outside of approve cutting permits and will not likely be addressed by harvesting within the next 2 year time frame. These treatments reduce unsalvaged losses by decreasing attack and mortality caused by the mountain pine beetle. All increasing populations of MPB and inaccessible areas where MPB has been detected should be treated to decrease populations. Without these treatments, MPB populations will increase, and large areas of pine will be killed.

**Trap Trees For Douglas-Fir Beetle And Spruce Beetle Control**
Trap trees contain emerging DFB or SB populations and, therefore, reduce the threat of infestation to adjacent, susceptible stands. Trap trees also provide an additional source of fibre supply since they must be removed from the site. Reduction of unsalvaged losses and utilization of the trap trees ensures continued revenue to the Crown. Numbers of trees will fluctuate on a yearly basis depending upon beetle population levels.

**Pheromone Deployment For The Control And Monitoring Of Bark Beetles**
Pheromones (semiochemicals) restrict the dispersal of bark beetles from stands or areas and can concentrate attacks on specific trees or stands. The overall effect is a reduction of unsalvaged

losses by decreasing attack and mortality caused by bark beetles. Reduction of losses will maintain revenue to the Crown. Semiochemicals are used to monitor the timing and duration of bark beetle flight periods. The intent is to maximize control efforts and restrict spread of infestations by using resultant information to restrict movement of infested materials during beetle flight periods. The recommended level of activity delivery is dependent upon current and predicted bark beetle populations. The critical level is that which effectively and efficiently manages a bark beetle epidemic.

Summary table containing regional needs for 2001/02 may be found in Appendix 7.

## 12.0 FOREST RECREATION

The strategic objective of the Forest Recreation program is:

***"To manage and facilitate public use of Provincial Forest land for a wide spectrum of recreational activities considering both safety and cost effectiveness."***

Approximately 80% of the Province of BC is managed by the MoF. Residents and tourists utilize this land for a wide variety of recreation pursuits which include; viewing from homes and highways, hiking, camping, fishing, water sports, berry picking, hunting and firewood gathering. MoF manages and facilitates recreation use by way of a recreation program, which provides for a wide spectrum of recreation opportunities for a variety of recreation activities.

**Strategy** - ***"To identify and manage the recreation and visual resource"***

Tactics to achieve this include:
- assessing use, demand and value of the recreation resource
- maintaining a recreation and landscape inventory
- ensuring that the recreation and visual resource, are considered in resource management decisions
- establishing visual quality objectives and developing design solutions to meet these objectives
- planning and managing for commercial and non commercial use

**Strategy** - ***"To facilitate public use of Provincial Forest land"***

Tactics to achieve this include:
- informing the public about recreation opportunities
- maintaining, rehabilitating and developing a network of campsites and trails according to regional direction
- enforcing recreation policy, procedures and regulations

### Recreation Priorities

| Priority | Activity | Description | Quantifiables |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | Recreation Resource Management | • Meeting FPC requirements (e.g. VIA, intra & inter agency referrals, establishing site & trail objectives, participating in district/regional planning initiatives, sec 102/105, etc.)<br>• Updating recreation inventory, including FTAS. | • # Section 105 order<br>• # maps sheets |
| 2 | Recreation Facility Maintenance | • Maintenance of managed BCFS sites (cleared, signed, and receiving regular maintenance)<br>• Maintenance of managed BCFS trails (cleared, signed, and receiving regular maintenance)<br>• M & E of rec. facilities<br>• Production of district brochures (region) and local area brochures (district) | • No. of sites<br>• No. of vehicle units<br>• No. of summer trails<br>• Km. of summer trails<br>• No. of winter trails<br>• Km. of winter trails<br>• Name of district brochure<br>• Quantity of district brochures<br>• Name of local area brochures<br>• Quantity of local area brochures |
| 3 | Recreation Facility Rehabilitation | • Refurbishment of campsites and trails to meet BCFS standard<br>• Replacement of bridges on of bridges on trails | • No. of sites<br>• No. of vehicle units<br>• No of summer trails<br>• Km. of summer trails<br>• No. of winter trails<br>• Km. of winter trails<br>• Trail name & bridge location |
| 4 | Recreation Facility Development | • Development of sites and trails (consistent with higher level plans, plan to be named).<br>• Construction of bridges on trails.<br>• Managing Sec 102/FRBC applications. | • No. of sites<br>• No. of vehicle units<br>• No. of summer trails<br>• Km. of summer trails<br>• No. of winter trails<br>• Km. of winter trails<br>• Trail name & bridge location |

**Description of Activities**

**Resource Management Activity:**
This activity covers all of the work associated with management of the recreation resource, most of the work is delivered by the RO Recreation, however if there is recreation map sheet updating, there may be costs associated with a recreation inventory contract. The work in this activity covers the following:

- FPC Act related work (Visual Impact Assessments, Sec 102/105, site/trail objectives, strategic and operational planning) and referrals (CBR, FDP's, M & W plans, etc.).
- Updating recreation inventory map sheets including FTAS.

As a footnote for Sec. 105 work, Sec. 105 work for management of the recreation resource (geographic areas which are not sites and trails) would be quantified here, but not Sec 105 closures for specific sites and trails, which would be a maintenance item.

**Facility Maintenance Activity:**

This activity is where the recreation program spends most of its money. This activity deals with maintaining and managing our recreation infrastructure which consists of campsites, trails and interpretive forest sites as well as providing public information on how to find and use our facilities.

For site maintenance, all maintained sites must meet the definition as per the Policy Manual, they must be signed, contain a toilet, and receive regular maintenance. Site maintenance is defined as being; annual painting and staining, minor repairs, janitorial work, toilet pumping and routine replacement of furniture to maintain facilities to the ministry standard.

For trail maintenance, all maintained trails must meet the policy definition, they must be signed, cleared, and receive regular maintenance. Trail maintenance is defined as being; sign painting and staining, wind falling & brushing and minor tread repairs to maintain the trail to standard.

If there are monitoring and enforcement requirements associated with facility management, this is where it is budgeted for, e.g. costs associated with maintenance of Sec 105 orders on sites or trails, such as the annual closure of Enid Lake for the May 24 weekend, etc.

**Facility Rehabilitation Activity:**
This activity is where deteriorated facilities are brought up to the program standard. If a district has brought an existing unmanaged trail under management, this is where budgeting occurs for the trails rehabilitation to the BCFS standard prior to it coming under routine maintenance. A campsite being rehabilitated is assumed to meet the definition of a managed site. For trails that are being rehabilitated, the process of assessment, referrals, completed clearance, and works required must be gone through prior to the work commencing.

Campsite rehabilitation is defined as being; site redesign, graveling roads and pads, redefinition of camping pads, furniture replacement and removal / abatement of hazards throughout the campsite.

Trail rehabilitation is defined as being; redefinition of tread, installation of drainage structures, tread relocation, removal / abatement of hazards, bridge replacement, sign installation and wind falling / brushing.

**Facility Development Activity:**
Development is for provision of future opportunities. For this activity, there must be a link between a process and the need for development. This process should be a higher level plan such a strategic or landscape level plan or a public process that has been completed. Prior to development, the process of obtaining a project number, assessment, referrals, completed clearance, site plan/trail design and establishment of objectives must be gone through.

Summary table containing regional needs for 2001/02 may be found in Appendix 8.

## 13.0 WATERSHED RESTORATION (NON FRBC PRIORITY)

The strategic objective of the non FRBC component of the Watershed Restoration program is:

***"To mitigate existing forest resource impacts and reduce the risk of future potential impacts caused by past forest harvesting practices and roads on non status roads required to provide for public safety, protect private property or other improvements (eg. highways, utilities, etc) where the risk is high"***

FRBC has refocused its investments on restoring high priority watersheds. High priority watersheds are those with high fisheries values, or that provide community water supplies and have a high likelihood of restoration success. There are however, in addition, non status roads within watersheds that pose significant risk to human safety, domestic dwellings, industrial development (eg. Public roads and utilities) that although very high or critical priorities are not eligible for FRBC funding.

Summary table containing regional needs for 2001/02 may be found in Appendix 9.

## 14.0 BRIDGE REPLACEMENT

The strategic objective for the Bridge Replacement program is:

***"To replace bridges and major culverts on Forest Service Roads where the structures present a significant risk to the surrounding environment, to user safety, or to short term fibre supply."***

The need for a Bridge Replacement program with adequate ongoing funding is to address a substantial number of old bridges and culverts that were built on Forest Service Roads with inadequate materials or with an unsatisfactory design life. These structures are deteriorating to the point they cannot safely carry design loads, or they pose a significant risk to the environment or other resource values. These structures, if requiring closure, may significantly impact the economy through reduced access to short term fibre supply.

Summary table containing regional needs for 2001/02 may be found in Appendix 10.

## 15.0 ROAD AND BRIDGE MAINTENANCE

The strategic objective for the Road and Bridge Maintenance program is

***"To provide appropriate access through the Forest Service Road network for the forest industry, the public, other stakeholders."***

The Forest Service Road (FSR) network provides the primary vehicular access into all major watersheds within the Nelson Forest Region. The overall objective of the FSR network is to provide vehicular access to permitted industrial forest users, commercial users ( ranchers, pipeline companies, railroad maintenance crews, BC Hydro, BC Tel, etc.) and of course the general public. Surface maintenance, culvert replacement, structural maintenance, road deactivation, road upgrades, mass wasting repairs, predictive data bases, easements and right-of-way acquisitions are essential for providing safe, stable, and durable access across these road systems.

**Strategy:**
**"Assess maintenance risks and provide continuing maintenance on Forest Service roads and bridges as indicated through inspections and schedules."**

Tactics to achieve this include:

- Periodically inspect the condition of, and the structures on, all FSR consistent with an inspection schedule and recent weather events.
- Continue to maintain a digital inventory of all FS roads and bridges and the database known as the Bridge Register Information Management System (BRIMS).
- Provide routine surface and structural maintenance consistent with inspection results and maintenance schedules.
- Net down the FSR system by deactivating FSR's no longer needed as part of the MOF road infrastructure.
- Upgrade segments of FSR's to meet FPC requirements in sensitive areas.
- Provide emergency maintenance as necessary to ensure safe road conditions on priority road systems.
- Initiate road closures when available finances are insufficient to ensure public safety or environmental integrity.
- Continue to provide snow removal, grading, culvert work, removal of danger trees, vegetation control, ditch cleaning and grading, bridge work and other associated maintenance activities at times of year consistent with environmental need and user safety.
- Develop tools for predicting and preventing maintenance problems. This would include a database on the occurrence of mass wasting, geology, site conditions, weather events and so forth on problem maintenance sites.
- Identify watersheds and road networks that have a higher risk of erosion or maintenance problems and prioritize schedules to meet those anticipated needs.
- Continue to require road maintenance by those users holding a permit for industrial use.

**Strategy:**
**"Acquire right-of-way parcels and easements necessary to ensure that unhindered (free & clear) access exists to Crown lands that lie behind alienated lands."**

Tactics to achieve this include:

- Maintain a prioritized list of access problems and stakeholder needs for access to Crown lands that can only be reached through alienated lands.
- Periodically review access needs and road locations to determine if alternate access routes could be developed rather than the purchase or lease of alienated lands.
- Where access to a FSR network requires crossing private land, negotiate access agreements or land purchases on required additions or existing roads without an agreement.
- Conduct right-of-way surveys using BC Land Surveyors to develop the necessary plans needed for property negotiations.
- As agreements are reached and roads constructed, add these to the FSR network.

Summary table containing regional needs for 2001/02 may be found in Appendix 10.

## 16.0 HABITAT ENHANCEMENT THROUGH SILVICULTURE

### 16.1 Purpose

Old growth and mature forest have been harvested and new forests regenerated over vast areas of British Columbia using increasingly intensive management practices. While such practices may speed and increase the amount of wood fibre produced, they tend to limit the diversity of stand development phases and greatly shorten the time between logging disturbances relative to the potential range of natural structures and disturbance regimes. Intensive forest management usually produces stands that are structurally and compositionally homogeneous, resulting in a loss of habitat variability and biodiversity. Fortunately, the same silviculture activities used for fibre production can be modified to create or enhance desired habitat attributes and aid in the preservation of biodiversity.

The Ministry of Environment, Lands & Parks (MELP) strategic objective for the Sustainable Harvest Program is:

***"the enhancement and protection of wildlife and fish habitat in second growth forest through planning, monitoring and training."***

**Planning:**

- setting regional land district strategies and priorities for protecting and enhancing environmental values;
- developing landscape unit plans detailing the location, type and extent of silviculture treatments best suited for habitat enhancement projects; and
- developing an information system to aid in the planning and evaluation of habitat management.

**Monitoring:**

- to assess existing and proposed silviculture treatments relative to stated or desired objectives and results proposed in prescriptions;
- to assess the effectiveness of silviculture treatments in maintaining habitat and ecosystem function and diversity;
- to improve integration of fish, wildlife and water resource values with silviculture planning and implementation;
- to provide a baseline level of habitat and ecosystem information with which to better evaluate silviculture and other resource management objectives;
- to ensure terrestrial and aquatic ecosystems are not exposed to avoidable risks;
- to ensure that silviculture treatments are conducted in compliance with the Forest Practices Code; and
- results of monitoring should be used to refine practices, goals and priorities.

**Training:**

- develop/refine guidelines for habitat protection and enhancement when conducting silviculture treatments in second growth stands;
- training for licensees, contractors and ministry staff related to managing environmental values and non-timber resources,
- implementation of habitat protection guidelines.

Investment in the habitat enhancement activities discussed in the Sustainable Harvest Resource Management Plan will aid in restoring and maintaining the ecological integrity and environmental sustainability of the forests, and will provide job creation benefits.

## 16.2 The Process Of Setting Program And Project Priorities

### Sustainable Harvest Program:

A review of the strategic documents listed in Table F and discussions with Habitat Protection staff identified the need for the following habitat enhancement projects:

**Reduce Ingrowth Effects on Forage and Browse Production:**
The fire-maintained grasslands and open forests of the Bunchgrass, Ponderosa Pine and Douglas-fir zones have historically produced large quantities of good quality forage and browse. These areas are prime winter range for deer, elk and sheep, as well as critical spring/fall range for livestock. There is an inverse relationship between understory forage production and the density of the forest canopy: as canopy closure increases through forest ingrowth, forage and browse production decreases (Dodd et al, 1972) having also a loss of forage quality. This also affects additional animal species such as birds, small mammals and reptiles. Red and blue listed species put at risk by forest ingrowth include the long-billed curlew, Columbian Sharptailed Grouse, Lewis' Woodpecker, and the yellow badger (Gayton et al., 1995).
Reduction of ingrowth effects are needed, and can be achieved through a combination of enhanced forest management techniques.

**Deer, Elk and Open Forest and Grassland Dependant Species Winter Range**

**Enhancement:**
In several landscape units dominated by second growth, with few widely spaced winter ranges, there is a need to create additional winter ranges by hastening the development of old growth forest attributes for deer, elk and open forest end grassland dependant species.

**Deer and Elk Spring Forage Enhancement:**
During winters of heavy snowfall, ungulates expend extra energy moving through deep snow, while taking in less energy from forage than normal. By spring, they may be weak and near starvation. Quality spring forage is needed close to winter ranges.

**Old Growth Attribute Enhancement:**
In heavily harvested landscape units characterized by second growth it is a priority to re-establish

old growth attributes on selected sites to meet the requirements of old growth dependant species (e.g., goshawk and cavity nesting birds and mammals).

**Riparian Restoration:**
Prior to implementation of the Forest Practices Code forests were often clear cut harvested to the edge of waterbodies. In these areas, it is a priority to re-establish forests and habitat conditions similar to those that existed prior to harvest, particularly when conducting Enhanced Forestry Silviculture Projects in adjacent areas.

Appendix 8 provides a description of the desired habitat attributes for each type of habitat enhancement and information on site selection. While all silviculture treatments may affect habitat supply positively in one way or another, only those projects where the primary objective is habitat enhancement and involve treatments incremental to those of fibre production are classified as habitat enhancement.

## 16.3 Knowledge Gaps And Funding Needs

There are a number of studies and additional activities, which are identified for FRBC funding specific to habitat enhancement in second growth stands:

### Maintenance and Monitoring of Endangered Ecosystems and Plants:

Identified provincially red and blue listed endangered plants and ecosystems exist within several landscape units within the Kootenay Region. A specific maintenance and monitoring strategy must be developed to ensure linkages to treatment areas and higher level planning enhanced forestry.

### Forest Practices Code Compliance and Effectiveness Monitoring:

To determine the degree to which habitat protection measures afforded by the Forest Practices Code are followed by licencees and others working on FRBC funded silviculture projects; and to assess the effectiveness of silviculture treatments in maintaining existing habitat features (e.g.: wildlife tree patches and riparian reserve zones) and the restoration of important habitat attributes in second growth (e.g.: hasten the development of wildlife trees, old growth characteristics and vertical and horizontal structural diversity).

Studies must be conducted to assess the impacts of silviculture treatments not only on specific species or guilds, but also on entire forest ecosystems, and to determine the best treatment techniques to protect or achieve desired habitat attributes.

### Surveys and Assessments

A number of backlog areas are recommended for lower stocking standards or deferment in order to fulfil habitat supply and biodiversity objectives. Assessment and prescriptions are required to substantiate the recommendations.

### 16.4 Additional Funding Considerations

Many FRBC sponsored projects involve vegetation management activities and thus the need for a Pesticide Use Permit (PUP). MELP staff must review these applications; however, the ministry does not receive funding from FRBC for this added workload. FRBC should consider compensating MELP for the review of permits required for FRBC funded projects.

The target number of hectares to be treated under each type of habitat enhancement project are to be used as performance measures in this RMP. The target number of hectares will be compared to the actual number of hectares treated. Further work on performance measures is required through MELP review and recommendation to FRBC. The current performance measures do not directly contribute to timber volume gain or employment calculations, nor do they measure the effectiveness of the treatments for habitat enhancement.

All habitat enhancement projects listed in Table F were rated by MELP as being of high priority on an ecological basis for maintaining biodiversity.

### 16.5 Sustainable Harvest Program Strategy For Delivery

The Sustainable Harvest Program provides a mechanism to implement activities, which not only enhance the forested land base but also make significant contributions to the associated non-timber values. MELP's goals of habitat enhancement and conservation of biodiversity can be addressed by adopting the following strategies:

**Strategy - *"To establish and communicate broad, ecosystem level criteria for the protection and enhancement of non-timber values, to be incorporated into all Sustainable Harvest activity planning by 2003"***

Tactics to achieve this include:

- Setting regional and district strategies and priorities for protecting and enhancing values;
- Developing landscape unit plans detailing the location, type and extent of silviculture treatments best suited for habitat enhancement projects;
- Developing an information system to aid in the planning and evaluation of habitat management;
- Conveying strategies and information in landscape unit plans to licensees and the Ministry of Forests.

**Strategy - *"To develop and implement operational harvest guidelines for all critical habitat types as identified by resource inventory information by year 2003"***

Tactics to achieve this include:

- Critical habitat types will be identified through site series mapping and inventories, and information already complied by the Conservation Data Centre; Guidelines will be developed to protect and enhance existing habitat attributes;

- Guidelines will be developed to restore important habitat attributes in second growth forests identified during landscape unit planning; and
- Landscape units will be divided into different resource management zones. Specific guidelines will apply to each management zone and be incorporated into Silviculture Agreements (replacement to the Five Year Silviculture Plan).

## 16.6 MELP Habitat Enhancement Priorities – Sustainable Harvest Program

Review of strategic documents and discussions with Habitat Protection staff identified the need for eight types of habitat projects: reduce ingrowth effects on forage and browse production; deer, elk and open forest and grassland dependant species winter range enhancement; deer and elk spring forage enhancement; old growth attribute enhancement; riparian restoration; and specific habitat/ecosystem maintenance, monitoring and assessments. A brief description of the desired habitat attributes for each type of project and information on the selection of sites best suited for enhancement is provided below.

### Reduce Ingrowth Effects on Forage and Browse Production:

The dry, low elevation grasslands and open forest and grassland stands of British Columbia's southern interior are defined by the Forest Practices Code Biodiversity Guidebook as Natural Disturbance Type 4 (NDT4), characterized by "frequent, stand-maintaining fires". These stands include the Biogelclimatic Zones Interior Douglas fir (IDF), Ponderosa Pine (PP), and dry variants of the Interior Cedar –Hemlock (ICH). Low intensity surface fires are a part of the natural function of these ecosystems, maintaining a mosaic of grassland and open forest, while at the same time promoting the development of fire-tolerant overstories of mature ponderosa pine, Douglas-fir and Western larch. Several decades of active fire suppression in the NDT4 has resulted in tree establishment in previously treeless openings (encroachment) and excessive tree recruitment in open forests (ingrowth) beyond the level these sites can support. The primary tree species responsible for both processes is Douglas fir. The consequences of ingrowth and encroachment are poor forest health, poor timber quality and degraded range and habitat values.

Strategic level planning now focuses guidelines intended to improve productivity and health of fire maintained forests and rangelands by restoring stand structure and species composition through modern methods of timber harvesting, spacing and prescribed burning. Restoration improves forest stand vigour, increases wildlife carrying capacity, reduces the risk of catastrophic wildfires, recycles nutrients, and rejuvenates natural plant communities. Financial support for restoration efforts is provided from a wide consortium of interests, based on planning and implementation strategies developed through multiple agencies.

### Deer and Elk Spring Forage Enhancement:

During winters of heavy snowfall, ungulates expend extra energy moving through snow, while taking in less energy from forage than is normal. By spring, they may be weak and near death from starvation. At such times, it is critical for them to obtain highly nutritious food as soon as possible. Consequently, good quality spring forage is needed close to winter ranges. Spring forage enhancement projects are encouraged within 500 meters of deer and elk winter ranges to meet this requirement. On many potential spring ranges, growth of forage species is limited by the closed canopies of dense young forests. Techniques usually focus on creating forage beside cover areas either by sequentially harvesting small blocks, or by thinning stands that still have abundant forage species in the understory.

**Deer, Elk and Open Forest and Grassland Dependant Species Winter Range Enhancement:**
In several landscape units dominated by second growth forest with few widely spaced winter ranges, there is a need to create additional winter ranges by hastening the development of old growth forest attributes on south facing slopes. Through manipulation of stand density and uniformity it may be possible to produce useful ungulate winter range in second growth stands much earlier than would occur naturally with benefits to other open forest and grassland dependant species. The process begins with the selection of young stands, ideally Douglas-fir, on sites with appropriate topographic characteristics (generally southern exposure, 300 to 1000 meters in elevation, slope 30 to 80 percent, and a few rocky outcrops). The primary approach is to thin and prune the stand early to maintain a good forage base and minimize debris accumulation. Stand development is then monitored and additional stem removal or pruning is conducted on small areas when forage production begins to decline. More detailed information on deer and elk winter range, thermal cover, and spring forage enhancement is provided in "J.B. Nyberg and D. W. Janz. 1990. *Deer and elk habitats in coastal forests of southern British Columbia*. MOF and MELP".

**Old Growth Attribute Enhancement:**
In heavily harvested landscape units characterized by extensive areas of second growth, the rapid development of old growth attributes is important to meet the requirements of old growth dependent species (goshawks, cavity nesting birds and mammals), particularly where old growth stands are limited. Spacing, pruning, and fertilization may hasten the development of these charactertistics.

**Riparian Restoration:**
Many cutblocks harvested prior to implementation of the Forest Practices Code were harvested to the edge of waterbodies. Frequently, these riparian areas regenerated to thick brush with poor conifer representation. In these areas, it is a priority to re-establish forests and habitat conditions similar to those that existed before harvest. Cluster planting with large nursery stock and reduced stocking rates may help meet these objectives. It is important to grow big trees as soon as possible to provide bank stability and vertical stand structure, and as future sources of wildlife trees and coarse woody debris for aquatic and terrestrial processes. Fast-growing and short-lived deciduous trees will be the first species to fulfil these roles. Consequently, deciduous tree representation is important in riparian areas currently lacking large conifers.

Riparian restoration projects funded through the Enhanced Forestry Program are not intended to be of the same magnitude or replace those funded through the Watershed Restoration Program. Rather, if FRBC funded silviculture work is being conducted adjacent to logged riparian areas, then measures should be taken to re-establish habitat conditions similar to those that existed prior to logging.

## 17.0 FOREST RESOURCES INVENTORY

In 1999/2000 FRBC shifted their investment strategy. The SSFM objective is now focused towards identifying and addressing key gaps in knowledge for sustainable forest management. This shift from inventories to knowledge gap address does not identify the complete spectrum of resource inventory information required by the MoF, MELP and others. Hence, the Forest Resources Inventories component of the RMP has been developed to capture those inventories that are a resource management need, and do not meet FRBC's eligibility requirements.

The FRI tables, found in Appendix 11, provides information on the status of a comprehensive list of forest resource inventories and an indication of the need for the information generated by these inventories under various business drivers. This information will help land managers identify weaknesses in resource inventory information as required by key business drivers in their management area leading to the realization of where investments are required.

## Appendix 1 - RMP Consultation

The RMP development process is a collaborative one lead by Forest Renewal BC and the Ministries of Forests (MoF) and Environment, Lands and Parks (MELP). The final RMP is a reflection of the co-operative effort between the ministries and major stakeholders. Stakeholder involvement was achieved throught the establishment of multi disciplinary steering committees (SC) to guide development of the Sustainable Harvest (SH), Enhancing Environmental Values (EEV) and Strengthening Sustainable Forest Management (SSFM) components of the RMP. In addition, major stakeholders were kept informed/involved through the circulation of SC meeting minutes. Regional orientation sessions were broadly advertised and held for the EEV and SSFM programs.
Co-operation and consultation between the ministries and major stakeholders will continue in order fine tune RMP content and facilitate the recommendations implementation.

Steering Committee memberships are as follows:

**SH**

- B. Peschke (MoF – Chair)
- B. Simpson (MoF)
- L. Peitzsche (MoF)
- I. Listar (MoF)
- M. Besko (MELP)
- R. Allen (FRBC)
- P. Affleck (ILMA)
- M. Belcher (CFI)
- R. Augustin (Kalesnikoff)
- D. Lang (P&T)

**EEV**

- K. Eichenberger (MELP- Chair)
- H. Tepper (MELP)
- T. Anderson (MELP)
- B. Peschke (MoF)
- D. Bouzane (FRBC)
- P. Affleck (ILMA)
- R. Piva (Wyndell Box Lumber)
- D. Wunder (Atco)
- B. Green (CRIFFIC)

**SSFM**

- D. Hamilton (Facilitator)
- B. Peschke (MoF)
- K. Eichenberger (MELP)
- M. Geisler (MoF)
- J. Pollack (MoF)
- M. Besko (MELP)
- D. Bouzane (FRBC)
- M. Bakelaar (IAMC)
- P. Affleck (ILMA)
- L. Havens (CFI)
- J. Beerbauer (NGO)
- P. Jeakins (Arrow IFPA)
- C. Hollstedt (SIFERP)
- A. Ferguson (SFP)

# Appendix 2 - Checklists for Resource Management Plan (RMP) Ground Rules

The following checklist should be used to confirm that RMP ground rules contain the provincially required elements:

☐ Roles and responsibilities

☐ Preliminary budget by management unit and Strategic Objective

☐ Provincial and regional performance measures

☐ RMP format and content

☐ Principles and expectations for partner involvement

☐ Requirements for reporting on partner involvement

☐ Terms of reference for planning teams for each Strategic Objective: roles and responsibilities (including duties of the chair, such as overall team coordination, setting meeting times and agendas, ensuring documentation of team meetings and partner involvement activities); who will be asked for input and feedback; team composition; and decision making method.

The following checklist identifies optional ground rules elements:

☐ Purpose and objectives

☐ Geographic units for sub-regional RMPs

☐ Milestone dates

☐ Follow-up steps (investment planning, work plan preparation, and annual review)

☐ Key contacts (for the three agencies, by Strategic Objective)

☐ Conflict resolution guidelines

☐ Signatures (representatives of the three agencies).

Provincial guidelines for development of RMP ground rules, a set of ten principles for partner involvement in planning, and a set of definitions are attached.

# Guidelines for RMP Ground Rules

## Purpose and Objectives

The purpose of ground rules is to clearly define regional commitments of Forest Renewal BC, Ministry of Forests, and Ministry of Environment, Lands and Parks in the development of Resource Management Plans (RMPs). The ground rules are applicable to RMP components which deal with three Forest Renewal BC Strategic Objectives (sustainable harvest, enhance environmental values, and strengthen sustainable forest management).

Ground rules are intended to:

- Confirm preliminary Forest Renewal budget allocations;
- Confirm provincial and regional performance measures;
- Confirm regional specifics for RMP format, content, process, and time lines, within the overall framework of provincial RMP guidelines;
- Guide partner involvement in the RMP process;
- Guide communication and conflict resolution in the RMP process.

## Background

The Province of BC produces RMPs through co-operation among Forest Renewal BC (FRBC), Ministry of Forests (MoF) and Ministry of Environment, Lands and Parks (MELP). FRBC funds MoF and MELP for development of the RMP components within FRBC's mandate. The inconsistency of RMP ground rules used in 1999-2000 created challenges for the ministries and agreement holders involved in multiple FRBC regions.

## Roles and Responsibilities

Ground rules should contain a statement on roles and responsibilities, such as the following: "MoF and MELP, as stewardship agencies, are responsible for identification and prioritization of resource management investment opportunities. This includes involvement of agreement holders and others with relevant technical expertise. FRBC, as an investment agency, is responsible for selection of investments and for ensuring overall accountability of these investments. This includes informing interested parties (industry, labour, First Nations, environment, community, and government organizations) about the overall process and opportunities for involvement."

## Preliminary Budget Allocations

Ground rules should show preliminary budget allocations, by Strategic Objective and by management unit (where applicable). These figures will be used to guide resource management planning. Ideally, RMPs will identify priority investment opportunities which represent approximately 120% to 130% of allocations.

## Provincial and Regional Performance Measures

Ground rules should identify provincial and regional performance measures for each Strategic Objective.

## Geographic Units

Ground rules may specify geographic units for the various plans that together will comprise the regional RMP.

## RMP Format and Content

Ground rules should confirm consistency with the most current version of provincial RMP guidelines. In addition, ground rules may specify regionally specific format/content requirements.

## Principles and Expectations for Partner Involvement

Ground rules should confirm consistency with a set of principles for partner involvement in planning (see attached provincial version). Specific expectations for partner involvement should be identified in terms of reference for regional planning teams.

Ground rules may confirm FRBC commitment to inform a broader range of interested parties regarding the overall planning and evaluation process, how to get more information, and opportunities for involvement (input on investment planning in October and annual review in January-February).

Ground rules may state that FRBC will coordinate an annual review, including invitation to government, First Nations, community, industry, labour, and environmental organizations to review key documents and to provide feedback on the overall process and results (making it clear that finalized RMPs and investment plans will not be revised). Ground rules may further state that ministries will participate in the review process as resource people.

### Reporting on Partner Involvement

Ground rules should state that RMPs will include appendices indicating names and organizations of people on planning teams, people invited to provide input and/or feedback, and people who actually did provide input/feedback (by Strategic Objective). Ground rules should also state that ministries will retain all documentation of partner involvement, such as meeting minutes, submissions of input and feedback received, notes on comments received by phone, etc. The period that this material to be retained should also be specified (e.g. for two years).

### Planning Teams

Ground rules should identify planning teams for each strategic objective, and should include terms of reference which identify roles and responsibilities, composition, and method of decision making for each planning team. Terms of reference should specify what parties will be invited to provide input and/or feedback and who will provide overall team coordination, set meeting times and agendas, and ensure documentation of team meetings and partner involvement activities. To establish a decision making method, terms of reference may state that consensus will be used, and that in the event a consensus cannot be achieved, decisions will be made in the manner selected by the Chair (e.g., majority vote).

Ground rules may identify an overall regional RMP steering committee and terms of reference for that body.

### Milestone Dates

Ground rules may specify completion dates for milestones in the RMP process, including collection of input, preparation of first draft, collection of feedback, and preparation of final draft.

### Follow-up Steps

Ground rules may specify the timing and roles and responsibilities in follow-up steps: investment planning, work plan development, and annual process review.

For example, ground rules could state that MoF and MELP will conduct evaluations of RMP and investment plans, focusing on stewardship considerations and on consistency with higher level plans. In addition, ground rules could state that FRBC, in consultation with the ministries, will organize and facilitate a broad evaluation of resource management and investment planning in the previous year.

## Conflict Resolution Guidelines

Ground rules may include guidelines for conflict resolution. This section may include references to recognized strategies for preventing and resolving conflict, such as: focusing on underlying interests and avoiding being positional; seeking to understand and promote other parties' interests; and using interest-based negotiation skills to seek win-win solutions.

Ground rules may state that conflict resolution processes will be consistent with the principles and process outlined in the "Dispute Resolution" section of services agreements between the respective agencies. Ground rules may indicate a sequence of conflict resolution steps such as the following:

1. Informal resolution among the parties (using constructive, interest-based negotiation)

2. Resolution by the senior regional administrators for each of the respective agencies.

3. Resolution by Assistant Deputy Minister level representatives of the agencies.

## Signatures

It is recommended that ground rules be signed by representatives of each of the three agencies. Signatures are a way to confirm mutual commitments identified in the ground rules.

# Principles for Partner Involvement in Resource Management and Investment Planning

The following ten principles are designed to support sound partner involvement in resource management and investment planning. Practices which reflect these principles will be defensible in terms of widely accepted planning process standards.

## 1. Higher Level Plans

**RMPs and investment plans are consistent with higher level plans.** Participants in LRMPs (Land and Resource Management Plans) and Strategic Land Use Plans are invited to participate in annual evaluations of the overall resource management and investment planning.

________Performance measure: participants in annual evaluations indicate that RMPs and investment plans are consistent with the intent of higher level plans.

## 2. Who Is Invited

**Those who have relevant technical expertise** are invited to participate in development of RMPs, and **industry, labour, First Nations, environment, community, and government organizations** are invited to participate at one or more other stage(s) of the planning cycle.

________Performance measure: RMP appendices show that those with relevant technical expertise were invited to provide input and feedback in RMP development; documentation by FRBC shows that government, First Nations, community, industry, labour, and environmental organizations were invited to participate in investment planning and/or in evaluation of the overall process.

## 3. Process Transparency

**Interested parties are informed of process context.** Parties being invited to contribute input and/or feedback are informed of how such information will be used and how it fits into the overall planning cycle. FRBC informs ministries of criteria used in investment planning.

________Performance measures: participants indicate that they felt well informed about the process context and the planned use of their input/feedback; ministries indicate adequate understanding of investment planning criteria.

### 4. Degree of Involvement

**The degree of involvement being invited at various stages is explicit.** People are informed of whether their role is to provide advice, or to directly participate in decision making. Providing information without intent to use input/feedback is not involvement.

_____ Performance measure: participants indicate a clear understanding of the level(s) of involvement being invited.

### 5. Diversity of Opportunities

**There are a variety of opportunities for involvement.** Planning processes are designed to accommodate the diverse ways that people receive and provide information and the variety of desired levels of involvement.

_____ Performance measure: individuals within categories of intended participants indicate that they perceived appropriate options in the type and level of their involvement.

### 6. Plain Language

**Technical terms and acronyms are defined or explained.** To create fair opportunities for participation, technical terms and acronyms are clearly defined and/or explained in plain language.

_____ Performance measure: plans and presentation materials are tested on non-experts and necessary clarifications are made.

### 7. Utility

**Involvement in planning is designed to be productive.** Input and feedback is gathered when there are clear intentions and plans for use of that information.

_____ Performance measure: input and feedback is systematically documented, analyzed, and considered in decision making.

### 8. Public Accountability

**Planning processes are designed to maximize the effectiveness and efficiency of public investments in resource management.** Agreement holders and other invited parties provide input and feedback for the purpose of contributing to the public interest.

_____Performance measure: government agencies observe a shift of planning focus from inputs and private interests to outcomes and the public interest.

### 9. Closing the Loop

**The communication loop gets closed.** Feedback/input is thoroughly documented and made available to participants. Participants are informed of how their input/feedback has been used.

_____Performance measure: each effort to gather opinion is followed by efforts to inform participants of findings and how these have been used.

### 10. Process Development

**Planning processes are continuously improved.** Interested parties are invited to provide input and feedback on the planning process itself.

_____Performance measure: process evaluation is included as a component in each involvement exercise.

## Definitions

**Partner.** In the context of RMP ground rules, a "partner" may be an agreement holder, contractor, or other interested party. FRBC has identified five categories of partners, as follows: government, First Nations, community, industry, labour, and environmental organizations

**Agreement Holder.** An organization which is under contract to provide services on behalf of FRBC.

**Contractor.** An organization which is under contract with an agreement holder to provide services on behalf of FRBC.

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**Performance measure.** In the context of RMP ground rules, "performance measure" refers to specific objectives to be achieved, typically within specified time frames, relative to FRBC Strategic Objectives.

**Geographic units.** For various Strategic Objectives, geographic units or levels of planning may be FRBC regions, MoF districts, TSAs (Timber Supply Areas), and/or TFLs (Tree Farm Licenses).

Note: should any of the definitions provided here be inconsistent with definitions in services agreements between FRBC, MoF, and MELP, the definitions in services agreements will stand.

## Appendix I - RMP Consultation

The RMP development process is a collaborative one lead by Forest Renewal BC and the Ministries of Forests (MoF) and Environment, Lands and Parks (MELP). The final RMP is a reflection of the co-operative effort between the ministries and major stakeholders. Stakeholder involvement was achieved throught the establishment of multi disciplinary steering committees (SC) to guide development of the Sustainable Harvest (SH), Enhancing Environmental Values (EEV) and Strengthening Sustainable Forest Management (SSFM) components of the RMP. In addition, major stakeholders were kept informed/involved through the circulation of SC meeting minutes. Regional orientation sessions were broadly advertised and held for the EEV and SSFM programs.
Co-operation and consultation between the ministries and major stakeholders will continue in order fine tune RMP content and facilitate the recommendations implementation.

Steering Committee memberships are as follows:

**SH**

- B. Peschke (MoF – Chair)
- B. Simpson (MoF)
- L. Peitzsche (MoF)
- I. Listar (MoF)
- M. Besko (MELP)
- R. Allen (FRBC)
- P. Affleck (ILMA)
- M. Belcher (CFI)
- R. Augustin (Kalesnikoff)
- D. Lang (P&T)

**EEV**

- K. Eichenberger (MELP- Chair)
- H. Tepper (MELP)
- T. Anderson (MELP)
- B. Peschke (MoF)
- D. Bouzane (FRBC)
- P. Affleck (ILMA)
- R. Piva (Wyndell Box Lumber)
- D. Wunder (Atco)
- B. Green (CRIFFIC)

**SSFM**

- D. Hamilton (Facilitator)
- B. Peschke (MoF)
- K. Eichenberger (MELP)
- M. Geisler (MoF)
- J. Pollack (MoF)
- M. Besko (MELP)
- D. Bouzane (FRBC)
- M. Bakelaar (IAMC)
- P. Affleck (ILMA)
- L. Havens (CFI)
- J. Beerbauer (NGO)
- P. Jeakins (Arrow IFPA)
- C. Hollstedt (SIFERP)
- A. Ferguson (SFP)

# Appendix 2 - Checklists for Resource Management Plan (RMP) Ground Rules

The following checklist should be used to confirm that RMP ground rules contain the provincially required elements:

☐ Roles and responsibilities

☐ Preliminary budget by management unit and Strategic Objective

☐ Provincial and regional performance measures

☐ RMP format and content

☐ Principles and expectations for partner involvement

☐ Requirements for reporting on partner involvement

☐ Terms of reference for planning teams for each Strategic Objective: roles and responsibilities (including duties of the chair, such as overall team coordination, setting meeting times and agendas, ensuring documentation of team meetings and partner involvement activities); who will be asked for input and feedback; team composition; and decision making method.

The following checklist identifies optional ground rules elements:

☐ Purpose and objectives

☐ Geographic units for sub-regional RMPs

☐ Milestone dates

☐ Follow-up steps (investment planning, work plan preparation, and annual review)

☐ Key contacts (for the three agencies, by Strategic Objective)

☐ Conflict resolution guidelines

☐ Signatures (representatives of the three agencies).

Provincial guidelines for development of RMP ground rules, a set of ten principles for partner involvement in planning, and a set of definitions are attached.

# Guidelines for RMP Ground Rules

## Purpose and Objectives

The purpose of ground rules is to clearly define regional commitments of Forest Renewal BC, Ministry of Forests, and Ministry of Environment, Lands and Parks in the development of Resource Management Plans (RMPs). The ground rules are applicable to RMP components which deal with three Forest Renewal BC Strategic Objectives (sustainable harvest, enhance environmental values, and strengthen sustainable forest management).

Ground rules are intended to:

- Confirm preliminary Forest Renewal budget allocations;
- Confirm provincial and regional performance measures;
- Confirm regional specifics for RMP format, content, process, and time lines, within the overall framework of provincial RMP guidelines;
- Guide partner involvement in the RMP process;
- Guide communication and conflict resolution in the RMP process.

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# Appendix 3 – Sustainable Harvest

Arrow TSA
Boundary TSA
Cranbrook TSA
Golden TSA
Invermere TSA
Kootenay Lake TSA
Nelson Region summary
Revelstoke TSA
RMP SH summary
TFL #14
TFL#23
TFL #3
TFL #55
TFL #56
TFL #8
TFL #8 silviculture strategy

# Arrow
# Timber Supply Area

## Interim Silviculture Strategy

-- Version 1.3 --

British Columbia
**Ministry of Forests**

**Funded By**

**Forest Renewal BC**

**January 31, 2000**

# Contents

1. EXECUTIVE SUMMARY ..................... 1

2. Introduction ..................... 9
  - 2.1 About the Interim Strategy ..................... 9
  - 2.2 Methodology ..................... 10
  - 2.3 Acknowledgements ..................... 10

3. Higher Level Goals and Objectives .... 12
  - 3.1 Provincial Goals and Objectives ..................... 12
  - 3.2 Regional Objectives ..................... 12
  - 3.3 Higher Level Plans ..................... 12

4. Basic Data ..................... 14
  - 4.1 Land Area ..................... 14
  - 4.2 AAC 14
  - 4.3 Harvest Forecast ..................... 14
  - 4.4 Site Class ..................... 14
  - 4.5 Age Class ..................... 14
  - 4.6 Tree Species ..................... 14

5. Incremental Silviculture History .......... 16

6. Timber Harvesting Trends ..................... 17

7. Issues and Silvicultural Opportunities. 18
  - 7.1 Discussion of Issues and Opportunities .... 18
  - 7.2 Summary of Issues and Silvicultural Opportunities ..................... 29

8. Opportunities to Increase Timber Supply ..................... 36
  - 8.1 Potential Silviculture Strategies ..................... 36
  - 8.2 Workshop Review of Potential Strategies . 39
  - 8.3 Potential Harvest Forecast ..................... 57

9. Opportunities to Improve Timber Quality ..................... 58
  - 9.1 Product Objectives ..................... 58
  - 9.2 Potential Strategies by Response Time Frame ..................... 59
  - 9.3 Large Premium Log Analysis ..................... 61
  - 9.4 Timber Quality Forecast ..................... 65

10. Incremental Silviculture Strategy ........ 66
  - 10.1 General Strategy ..................... 66
  - 10.2 Log Product Objectives ..................... 66
  - 10.3 Silviculture Strategies ..................... 67

11. Silviculture Regimes and Investment Priorities ..................... 72

12. Incremental Silviculture Program ........ 73

13. Job Outcomes ..................... 74

14. Summary of Information and Research Needs ..................... 75

15. References ..................... 77

16. Abbreviations ..................... 78

# 1. EXECUTIVE SUMMARY

*Purpose*

This strategy is intended to help optimize the application of available funding for silviculture activities towards the goals of improving the future quantity and quality of both habitat and timber supply. The strategy will be considered as one of several inputs in decisions on funding allocations and treatment activities. The degree to which the overall strategy ultimately proves appropriate and is achieved will also be the degree to which the expressed targets will be achieved.

*Objectives*

1. The IFPA base case timber supply analysis forecasts the initial harvest level (IHL) of 615 000 m3/yr can be maintained for only one decade, after which it will drop over the next several decades to a mid term low of 451 200 m3/yr starting in the 4th decade (about 27% below the IHL). The first objective of this strategy, therefore, is to minimize the anticipated reductions in short and mid term harvest levels. Workshop analysis indicates there are limited silvicultural opportunities for achieving this objective. (There are, however, other non-silvicultural opportunities that are being explored under the IFPA Forestry Plan).
2. The IFPA base case analysis indicates that not only is the harvest forecast to drop, but also that this forecast may be optimistic because the available timber supply is only slightly above the forecast harvest level. A secondary short and mid term objective, therefore, is to increase the overall availability of timber for harvesting, particularly over the next 100 years. Workshop analysis indicates that silviculture activities can significantly contribute to this objective.
3. Because of the limited silvicultural opportunities to overcome the forecast base case mid term reduction in timber supply, improving the quality of the timber to be harvested during this time period is a viable alternative. A higher quality, high value timber supply could mitigate to some extent the reduction in income and profit associated with the expected reductions in harvest levels. A mid term objective, therefore, is to improve the quality of the timber to be harvested in this time period. Programs of spacing, pruning and fertilization can accomplish this. Pending the outcome of further investigation, emphasis could be placed on cultivating rust-resistant white pine trees wherever suitable. Western white pine grows very fast, is relatively rare due to blister rust infestation and a limited growing range, and produces high value wood.
4. In the long term, starting about 90 years from now, workshop analysis indicates improved estimates of the productivity of forest land as well as silvicultural activities can result in harvest levels of at least equal to if not greater than current levels. The long term objective therefore is to create a timber supply capable of supporting a steady harvest level of at least 620 000 m3/yr. Workshop analysis indicates that silvicultural activities can contribute significantly to this objective.

Accomplishing these objectives requires an incremental silviculture program substantially above historic levels. Some changes in basic silviculture activities also present opportunities to contribute to the objectives.

## Product Objectives

The following are product objectives at the log level for the Arrow TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | | |
| Peelers | All | 35+ cm DBH, clear, 5 m log, min 20 cm top. |
| Building Log | Douglas-fir, larch, lodgepole pine, spruce | 42.5+ cm DBH, straight, low taper, minimal twist, min 9 m log, min 27.5 cm top |
| Poles | western redcedar | 27.5+ cm DBH, 13 m log, straight, min 10 cm top, no rot. |
| Large logs* | All | 42.5+ cm DBH, 5 m log |
| White pine* | western white pine | 22.5+ cm DBH, tight knots. |
| Sawlog:* | All except lodgepole pine | 27.5+ cm DBH. |
| | lodgepole pine | 22.5+ cm DBH. |

* Values are enhanced when "clear" of knots.

## Major Silvicultural Strategies

The strategies listed below are those considered in the workshop and follow-up analysis to be appropriate towards achieving the working targets. Other strategies that were considered but deemed to have little opportunity at this time are documented in the report.

Some of the following are not within the traditional scope of silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them.

| No. | Strategy | Priority |
|---|---|---|
| Surveys | Conduct approximately 6 000 ha/yr of silviculture surveys in support of all strategies. | 1 |
| Surveys | Conduct approximately 1 600 ha/yr of retrospective OAF1 surveys over a 20 year period. | 1 |

## Short Term

**Objectives:**

- Minimize the anticipated reductions in harvest levels.
- Increase the overall availability of timber for harvesting.

**Working Targets:**

- Maintain the current harvest level for at least 5 years.

**Strategies:**

| | | |
|---|---|---|
| **ST2** | Late rotation fertilize 400 ha/yr to produce approximately 3 000 m3/yr of additional harvest volume by the 2nd decade. | 3 |
| **ST 4** | Improve timber availability by achieving green-up 6-8 years earlier in existing stands aged 1-20 years in the VQO zone outside of watersheds by: | |
| **(b)** | spacing 150 ha/yr to prepare them for fertilization; | 4 |
| **(c)** | fertilizing 300 ha/yr to reduce time until 7 m green-up by 2 years; and | 2 |
| **(d)** | undertake a project to improve site index estimates with the expected result of reducing 7 m green-up ages by 5 years. | current IFPA project |

## Mid Term

**Objectives:**

- Minimize the anticipated reductions in harvest levels.
- Increase the overall availability of timber for harvesting.
- Improve the quality of the timber to be harvested.

**Working Targets:**

- Create a timber supply capable of supporting a minimum harvest level of at least 451 200 m3/yr.
- Generate at least 4% of total harvest volume in the later mid term in premium large logs.
- Generate at least 2¼ % of total harvest volume in the later mid term in clear premium logs (clear logs will generally also be large logs).

| No. | | Strategy | Priority |
|---|---|---|---|
| **Strategies:** | | | |
| **MT1** | | Continue ST2: Late rotation fertilize 400 ha/yr to produce approximately 3 000 m3/yr of additional harvest volume. | 6 |
| **MT3** | | Improve timber availability by reducing the minimum harvest ages of stands aged 1-20 years by undertaking the treatments specified in strategy ST4. | see ST4 |
| **MT5** | | Reduce green-up ages of about-to-be-regenerated stands by 8 years in the VQO (base case - 28 yrs to 7 m ht) zone and by 10 years in the watershed zones (base case - 34 yrs to 9 m ht) by: | |
| | **(b1)** | increasing the use of improved seed with the expected result of reducing 7 m green-up ages by 2 years; | 1 |
| | | forming a licensee and MoF small business program seed planning and use co-operative to lobby for more and better improved seed and to co-ordinate the use of the best available seed to greatest strategic advantage; | |
| | **(b2)** | undertaking a project to improve site index estimates with the expected result of reducing 7 m green-up ages by 5 years; and | current IFPA project |
| | **(e)** | fertilizing 300 ha/yr at time of planting with the expected result of reducing 7 m green-up ages by 1 year. | 3 |
| **Q1** | | Space 400 ha/yr of existing stands aged 1 – 30 years so that at least 60% of harvested volumes in the latter half of the mid term are good quality sawlogs. | 5 |
| **Q2** | | Prune 300 ha/yr of existing stands aged 1 – 30 years in two lifts (= 150 ha/yr X 2 lifts) to create knot-free timber in the bottom 5.0 m log. | 4 |

## *LONG TERM*

**Objectives:**

- Maximize long term timber production within a context of sound multiple resource stewardship.
- Improve the quality of the timber to be harvested.

**Working Targets:**

- Create a timber supply capable of supporting a steady harvest level of at least 620 000 m3/yr.
- Generate at least 8% of total harvest volume in premium large logs (no current silviculture strategy implications).
- Generate at least 2¼ % of total harvest volume in clear premium logs (clear logs will generally also be large logs).

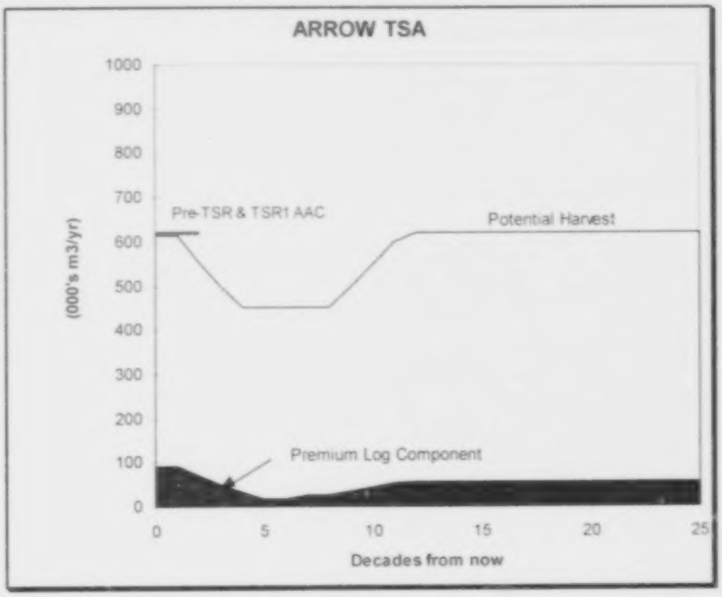
**Strategies:**

| | | | |
|---|---|---|---|
| **LT1** | | Maintain the timber harvesting land base by: | |
| | **(a)** | Treating approximately 400 ha of backlog NSR. | 1 |

| No. | Strategy | Priority |
|---|---|---|
| **(b)** | Maintaining approximately 200 ha of previously reforested backlog plantations (Assumed to be required. No estimate of actual need available). | 2 |
| **(c)** | Survey 2 000 ha/yr of pre-1987 SR area to ensure they remain fully stocked. | 1 |
| **LT2** | Increase the timber harvesting land base by 4.25% by: | |
| **(a)** | Rehabilitating 2 000 ha of deciduous stands (= 1% of THLB) at the rate of 100 ha/yr. (Priority based on high cost and high risk of not achieving growth rates due to opposition to use of herbicides.) | 6 |
| **(e)** | Rehabilitating 500 ha of fume kill (= 0.25% of THLB) at the rate of 100 ha/yr. (Requires integrated planning and design.) | 6 |
| **(f)** | Rehabilitating 3 000 ha of permanent access structures (= 3% of THLB) at the rate of 150 ha/yr. (Priority based on high cost and low anticipated yield) | 5 |
| **LT3** | Increase the volume of regenerated stands by 40% by: | |
| **(b1)** | Increasing the use of improved seed with the expected near term result of a 6% gain in LTHL, with a strategic target of 20% yield gain over the long term. | 1 |
| **(b2)** | Undertaking a project to improve site index estimates with the expected result of a 34% gain in LTHL. | current IFPA project |
| **(j)** | Repeat fertilizing 300 ha/yr, rising gradually over about 60 years to 1 250 ha/yr as more stands come under management, for an expected result of a 2% gain in LTHL. (Note: The initial 300 ha/yr are the same stands as in ST 4.) | 2 |
| **LT6** | Rehabilitate 100 ha/yr of old IU logged areas for the purpose of managing these areas for multiple non-timber values in order to lessen timber harvesting constraints elsewhere. | 7 |
| **Q1** | Continue mid term Q1 strategy. | 5 |
| **Q2** | Continue mid term Q2 strategy. | 4 |

### *Illustration of Working Targets*

*The following chart illustrates the above working targets. They represent the plausible high end of the potential of the timber resource relative to the IFPA base case. Changes to the base case would also effect changes to the potential forecast. These forecasts are interim and require confirmation through analysis and modelling.*



## Silviculture Regimes & Investment Priorities

The following table indicates incremental silviculture regimes which are suitable to attaining the above working targets and strategies.

### Incremental Silviculture Program

The following annualized program will contribute to achieving the above goals and strategies. This program is considerably above historic levels and some activities may require phasing in.

**Program Table - Ha, Arrow TSA August 17-18, 1999**

| Year | Surveys* | Backlog L1<br>Establish | Conversion<br>Rehab | Space | Prune | Fertilize | Total |
|---|---|---|---|---|---|---|---|
| 1 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| 2 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| 3 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| 4 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| 5 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| Subtot Yr 1 - 5 | 44,775 | 300 | 1,375 | 750 | 1,500 | 5,000 | 53,700 |
| 6 - 10 | 44,775 | - | 1,275 | 750 | 1,500 | 5,000 | 53,300 |
| Total Yr 1 - 10 | 89,550 | 300 | 2,650 | 1,500 | 3,000 | 10,000 | 107,000 |
| * Includes prescription and layout | | | | | | | |
| Unit cost ($/ha) | 32 | 925 | 2,825 | 1,130 | 725 | 255 | |

**Program Table - $ 000s, Arrow TSA August 17-18, 1999**

| Year | Surveys | Backlog<br>Establish | Conversion/<br>Rehab | Space<br>- | Prune<br>- | Fertilize<br>- | Total |
|---|---|---|---|---|---|---|---|
| 1 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| 2 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| 3 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| 4 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| 5 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| Subtot Yr 1 - 5 | 1,433 | 278 | 3,884 | 848 | 1,088 | 1,275 | 8,805 |
| 6 - 10 | 1,433 | - | 3,602 | 848 | 1,088 | 1,275 | 8,245 |
| Total Yr 1 - 10 | 2,866 | 278 | 7,486 | 1,695 | 2,175 | 2,550 | 17,049 |

**Program Job Outcomes, Arrow TSA August 17-18, 1999**

*__Short term__ employment associated with undertaking the silviculture activity, in person years*

| Year | Surveys | Backlog Establish | Conversion/ Rehab | Space - | Prune - | Fertilize - | Total |
|---|---|---|---|---|---|---|---|
| 1 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| 2 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| 3 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| 4 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| 5 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| Subtot Yr 1 - 5 | 22.4 | 3.0 | 29.5 | 13.1 | 45.0 | 5.5 | 118.5 |
| 6 - 10 | 22.4 | - | 27.3 | 13.1 | 45.0 | 5.5 | 113.3 |
| Total Yr 1 - 10 | 44.8 | 3.0 | 56.8 | 26.3 | 90.0 | 11.0 | 231.8 |

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job

*__Long term__ employment associated with improved quality and quantity of the timber resource*[1]

| Decade | Harvest Increment ('000 m3) | Incremental Jobs per year Region[2] | Incremental Jobs per decade Region[2] |
|---|---|---|---|
| 1 | (158) | (621) | (6,209) |
| 2 | (158) | (621) | (6,209) |
| 3 | (158) | (621) | (6,209) |
| 4 | (158) | (621) | (6,209) |
| 5 | (158) | (621) | (6,209) |
| 6 | (158) | (621) | (6,209) |
| 7 | (204) | (802) | (8,017) |
| 8 | (204) | (802) | (8,017) |
| 9 | (116) | (456) | (4,559) |
| 10 | (116) | (456) | (4,559) |
| 11 | (40) | (157) | (1,572) |
| 12 | (40) | (157) | (1,572) |
| 13 | (40) | (157) | (1,572) |
| 14 | (40) | (157) | (1,572) |
| 15 | (40) | (157) | (1,572) |
| 16 | (128) | (503) | (5,030) |
| 17 | (167) | (656) | (6,563) |
| 18 | (167) | (656) | (6,563) |
| 19 | (167) | (656) | (6,563) |
| 20 | (167) | (656) | (6,563) |
| 21 | (167) | (656) | (6,563) |
| 22 | (167) | (656) | (6,563) |
| 23 | (167) | (656) | (6,563) |
| 24 | (167) | (656) | (6,563) |
| 25 | (167) | (656) | (6,563) |
| Total | | | (134,367) |

Notes:

1. Assumes continuation of the silviculture program beyond the first 10 years, in accordance with the strategy. The total harvest increment is associated with all the silvicultural practices documented in the "Opportunities" section and is only partly attributable to spacing and fertilization practices. Some of the increase may be associated with pre-free growing silviculture that was not current practice at the time of strategy development.

2. Assumes 3.93 TSA level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre. (Source: TFL 23 MP #9 Timber Supply Analysis Report, p.39)

*Job Creation* The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets.

*Further Research and Information Needs*

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for a silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 39).

1. Before considering excluded non-merch forest types for their rehabilitation potential, first determine their role/contribution in meeting OGMA objectives. (ST1(b))
2. Compare terrain hazard mapping vs inventory ESA's to refine THLB net-down impacts. (ST1 (x1))
3. Evaluate the regeneration implications of harvesting high elevation areas as an outcome of potentially moving the operability line higher. (ST1 (x2))
4. MoF to provide a map of ESA regen areas to AFLG to review for accuracy. (ST1 (x1))
5. Evaluate the late rotation fertilization potential of smaller live-crown trees. (ST2)
6. Model the changes in sensitivity to forest cover constraints attributed to the use of large patch sizes in meeting biodiversity objectives. (ST3)
7. Investigate the stocking levels of Fdi and spruce stands aged 21-30 years and other-species stands aged 11-20 years to determine if their yields are more accurately estimated using TIPSY. (MT4)
8. Evaluate the impact of the reduction in site preparation over the past 2 decades on site productivity and stand yield estimates. (MT5 (a))
9. AFLG to form a seed planning and use co-operative is proposed for the TSA licensees to lobby for more and better improved seed and to co-ordinate the use of the best available seed to greatest strategic advantage. (MT5 (b1))
10. Investigate access to white pine seed; investigate green-up potential; connect with TFL 23 to investigate success. (MT5 (d))
11. Evaluate efficacy of fertilization at planting and impact on reducing time to reach green-up. (MT5 (e))
12. Assess low end stocking levels of regenerated stands (e.g., 1 000 sph actual vs. 1 200 sph used in IFPA timber supply analysis) for yield implications. (MT5 (f1))
13. OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (MT5 (f2))
14. Confer with Fish and Wildlife Branch re Arrow Lake fertilization and effects of fertilization on fish bearing streams. (MT5 (i))
15. MoF to provide the AFLG a map of excluded low sites to review for reclassification/rehabilitation opportunities. (LT2 (d))
16. Investigate Invermere's root rot OAF2 estimate methodology and research. Further study of root rot management techniques and resultant OAF2 impact is needed. (LT4)
17. Investigate effects of juvenile spacing on mountain pine beetle resistance. (LT 5 (a))
18. Provide Daryl & UBC people with the silv strategy to take it into account in their studies/projects. Note the need to analyze the cost/benefit of silviculture expenditures to consolidate OGMA's with old IU logged areas in riparian areas. (LT 6)

# 2. Introduction

## 2.1 About the Interim Strategy

This strategy is intended to help optimize the application of available funding for discretionary silviculture activities towards the goals of improving the future quantity and quality of both habitat and timber supply. The strategy will be considered as one of several inputs in decisions on funding allocations and treatment activities.

The limitations of time, budget and available information have tended to cause the focus in this first version of the strategy to be on the future quantity of the timber resource. It is expected that as the strategy development process evolves and as better and more information becomes available, the strategy will have more regard to the matters of future timber quality and the future quantity and quality of habitat supply.

To achieve the optimization objective, the opportunity evaluation process recorded herein is not limited by factors such as the availability of funding, funding source (e.g., public vs. private), or the ability to deliver a program. Because of this, the strategy generally illustrates the plausible high end of the potential of the timber resource that may be achievable as a result of increased silvicultural activities (other non-silvicultural strategies may also improve timber supply but are not within the scope of this strategy). Within this context as well as a broad context of cost-effectiveness, available treatment opportunities, and operational realities – all of which were explored in general terms in the workshop – potential silviculture treatment activities are ranked. The end result hopefully points to the most effective and efficient means of at least partially achieving the working targets. The degree to which the overall strategy ultimately proves appropriate and is achieved will also be the degree to which the expressed targets will be achieved. This, of course, could also be affected by future unknowns, such as major changes in forest policy, land base available for timber production, or market demand.

Although this strategy focuses primarily on silviculture, it is recognized that silviculture is part of a suite of potential strategies which together may influence the future quality and quantity of habitat and timber supply. In particular, other strategies are being pursued under the *Forestry Plan* of the Arrow Forest Licence Group (AFLG).

This strategy should not be confused with the allowable annual cut (AAC)[1] determination process. AAC's are based on actual practice and current information at the time of the determination. This strategy, on the other hand, is about creating a future state of our forests. Again, the degree to which the strategy proves appropriate and is achieved may influence future, but not necessarily present, AAC determinations.

This strategy is founded on readily available information and the knowledge of forestry professionals. It is intended as an interim strategy until a more in-depth analysis-based review is completed.

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[1] See "Abbreviations," page 78 for a full listing of abbreviations used.

## 2.2 Methodology

This strategy was prepared through the following process:

1. Prior to the district workshop, in co-operation with district office personnel, Timberline Forest Inventory Consultants Ltd., and the Arrow Forest Licensee Group (AFLG), L. P. Atherton & Associates undertook preliminary research to identify issues and opportunities relevant to improving the future quantity and quality of timber supply.
2. A district workshop was held August 17-18, 1999 in Castlegar, attended by representatives of the organizations listed below. Larry Atherton of L. P. Atherton & Associates and Doug Williams of Cortex Consultants Inc. led the session. Participants reviewed the potential opportunities along with others that arose. The outcome of the session was a regime table, complete with priorities.
3. The consultants incorporated the results of the workshop into the draft document and added forecasts of future harvest quantity and quality and of job outcomes.
4. After ministry review, the consultants submitted a completed strategy document to the Ministry of Forests (MoF) in electronic format as version 1.1. (The ministry will assign higher version numbers (e.g., 1.2, 1.3, etc.) as the strategy evolves and changes are made.)

## 2.3 Acknowledgements

The participation of the following persons and organizations at the district workshop is gratefully acknowledged.

| *Organization* | *Participant's Name* | *Title* |
|---|---|---|
| **Ministry of Forests, Arrow Forest District** | | |
| | Tom Johnston | Silviculture Officer |
| | Peter Lewis | Land Information Officer, Planning |
| **Ministry of Forests, Nelson Forest Region** | | |
| | John Pollack | Mitigation Researcher |
| | Bernie Peschke | Forest Sectors Initiatives Officer |
| **Slocan Forest Products Ltd.** | | |
| | Kathy Howard | Planning Forester |
| | Pat Cutts | Forest Renewal Coordinator |
| **Kalesnikoff Lumber** | | |
| | Reiner Augustin | Forestry Manager |
| **Atco Lumber** | | |
| | Ron Ozanne | Forestry Manager |

| *Organization* | *Participant's Name* | *Title* |
|---|---|---|
| | Mark MacAulay | Silviculture Supervisor |
| **Riverside Forest Products** | | |
| | Peter Love | Operations Manager |
| **Ministry of Environment, Lands and Parks** | | |
| | Norbert Kondla | Forest Ecosystem Specialist |
| **Arrow Forest Licensee Group** | | |
| | Paul Jeakins | Kokanee Forest Consulting |
| **Forest Renewal BC** | | |
| | Ian Johnston | Investment Officer |

The project was directly managed by Ivan Listar of the Ministry of Forests, Nelson Forest Region. Funding was provided by Forest Renewal BC under a contract between the Ministry of Forests, Nelson Forest Region, and Cortex Consultants, Inc.

# 3. *Higher Level Goals and Objectives*

## 3.1 Provincial Goals and Objectives

The *Incremental Silviculture Strategy For British Columbia (Interim)* states the Ministry of Forests' provincial level strategy. The strategy's executive summary is reprinted in Figure 1 on the following page. The provincial strategy was considered in the development of this TSA strategy.

It is recognized that not every management unit has the same capability to contribute to the provincial strategy's interim objectives. Further, it is recognized that these objectives may not be attainable at current funding levels. Their purpose is to provide general guidance to the application of available funds.

## 3.2 Regional Objectives

The region has not set out formal regional silviculture objectives. In the interim, the provincial objectives are accepted as being broadly applicable within the region.

## 3.3 Higher Level Plans

Formal higher level plans are strategic plans defined by the Forest Practices Code, however, there are currently no approved higher level plans covering the Arrow Forest District. The Kootenay-Boundary Land Use Plan has been approved but the decision whether to make it a higher level plan has not been finalized. Until that time it provides guidance for management practices.

There are other plans that exist at a higher level which are strategic (policies and guidelines), or operational that provide direction to any lower level of plans, prescriptions, or forest practices. These, however, are not higher level plans as defined under the Code.

Figure 1. Provincial Goals and Objectives

## ***STRATEGY AT A GLANCE***

***Purpose***

This strategy provides guidance to the application of available funds for incremental silviculture activities. It is not tied to a specified funding level.

***Government's Goals***

- Sustainable Use
- Community Stability
- A Strong Forest Sector

***Key Principles***

1. Because the distant future cannot be foretold, the best and only course of action in managing the timber resource is that which minimizes risk and maintains options.
2. British Columbia's forests are important locally, provincially, nationally and globally and should be managed in this context.
3. Each generation of British Columbians becomes the steward of the province's forest resources and has a moral obligation to preserve this heritage for future generations.

***Working Targets***

Within the context of the guiding principles:

WT 1: Minimize the anticipated interim reduction in timber supply so that provincial annual harvests of at least 65 million $m^3$ can be achieved during this period.

WT 2: Create a long term timber supply capable of supporting a steady long term provincial harvest level of at least 75 million $m^3$.

WT 3: Over the long term, maintain the production of premium quality logs at or above 10% of total harvest.

***Major Silvicultural Strategies***

- Increase the use of alternative silvicultural systems and commercial thinning.
- Achieve earlier green-up of harvested areas.
- Increase regenerated stand volumes 20%.
- Eliminate all pre-1982 good and medium site backlog NSR and all 1982 to 1987 backlog NSR.
- Initiate a long rotation quality management program for stands where harvesting must be delayed.

Other silvicultural and non-silvicultural strategies must also be implemented to achieve the working targets.

***Strategy Implementation***

Regional and management unit strategies must be developed, followed by programs and plans to implement them.

Source: MoF, 1999.

# 4. Basic Data

## 4.1 Land Area

| Description | Area (ha) | Area % |
|---|---|---|
| Total Area of TSA | 740 800 | 100 |
| Total Productive Crown Forest | 395 600 | 53 |
| Net Timber Harv. Land Base | 201 500 | 27 |

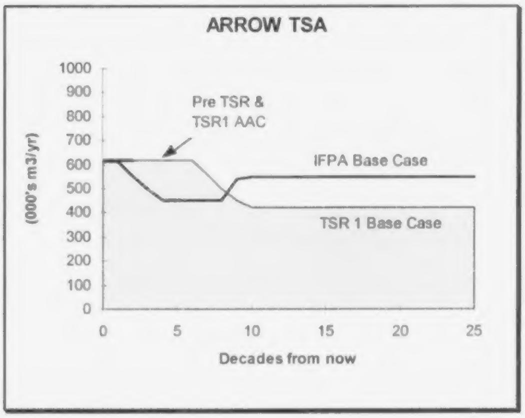
Source: Arrow IFPA analysis report - rounded to nearest 100 ha. The IFPA analysis THLB is 15 300 ha smaller than that used in TSR1.

## 4.2 AAC

| AAC Type | Pre-TSR | TSR1* | Change (%) |
|---|---|---|---|
| Conventional | 619 000 | 619 000 | 0.0 |
| Deciduous | - | - | |
| Insect/Disease | - | - | |
| Marginal | - | - | |
| Total | 619 000 | 619 000 | 0.0 |
| | | | |
| Woodlot AAC | | | |

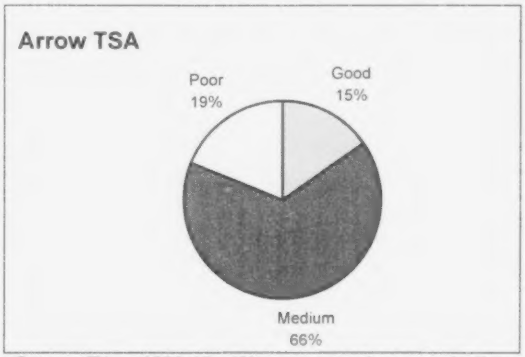
*effective October 1/95 Source: Pedersen, 1995

## 4.3 Harvest Forecast



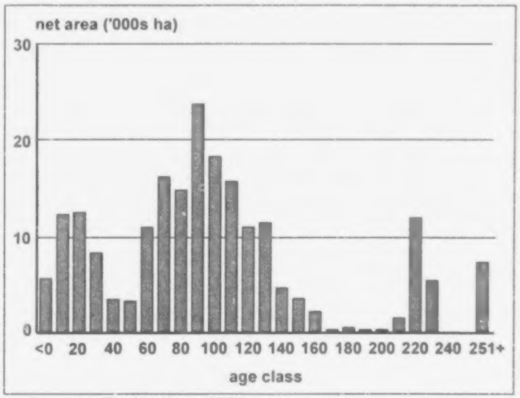
Sources: MoF, 1994. Pedersen, 1995. Timberline, 1999.

## 4.4 Site Class



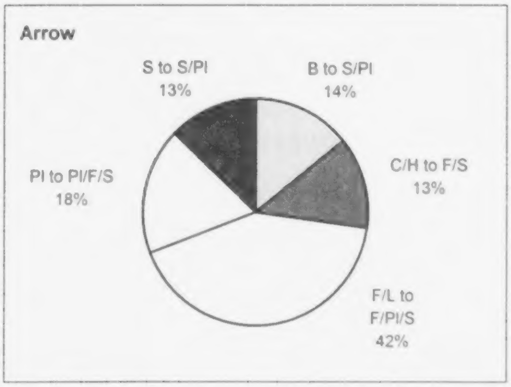
Source: Tline, 1999:10 + Wang, personal communication. Not including NSR.

## 4.5 Age Class



Source: Timberline, 1999

## 4.6 Tree Species



Data from Tline, 1999 + Wang. Not including NSR. Format: "current species" to "expected future species."

# 5. Incremental Silviculture History

| Treatment | IFPA Status (1999)<br>Incorporated in Timber Supply Analysis | Current Status (1999)<br>Source: AFD[2] |
|---|---|---|
| Backlog | 70% of the 2 000 ha of backlog NSR were assumed in the base case to be restocked within the next 10 years, with the other 30% restocked in 20 years. Two stocking classes were used with the breakpoint being 400 sph. | As of June, 1999 there are 1 813 ha of backlog NSR in the ISIS database. Approximately 565 hectares of this is inaccessible or uneconomic to treat. Of the remainder, 1/3 is assumed untreatable, 1/3 is assumed stocked and 1/3, or about 400 ha, is assumed to be planted over the next 10 years.<br>Recent backlog brushing has been about 90 ha/yr. Highest past brushing program was about 1 600 ha. |
| Conversion | None. | None. |
| Commercial Thin | None. | None at present. |
| Space | TIPSY used for F/L stands regenerated over the past 20 years and for all other stands regenerated over the last 10 years (Timberline, 1999:9). These stands and all future regenerated stands are modelled based on an initial density of 1 200 sph. This assumes stocking control on these stands. | Recent spacing has been about 150 ha/yr. Maximum past program level about 380 ha/yr.<br>At the end of fiscal 98/99, there was a total of about ______ ha of spaced stands (about ___% of THLB). |
| Prune | | Recent level of about 20 ha/yr. Max past program of 86 ha in 1996. Total accomplishment of ____ ha, none of which is 2nd lift pruned. |
| Fertilize | | There has been no fertilization in this TSA. |

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[2] AFD - Arrow Forest District

# 6. Timber Harvesting Trends

The Timberline analysis (Timberline, 1999:spreadsheet) indicates a 1st decade harvest level of about 2 200 ha/yr declining to about 1 500 ha/yr in decades 4 through 8. Harvested area then rises to 1 800 ha/yr in decades 9 & 10, falling thereafter to about 1 600 ha/yr. All areas are assumed to be clearcut (Timberline, 1999:13).

Although recent harvesting records indicate a relatively high proportion of partial harvesting and alternative silviculture systems, workshop participants estimate about 90% of recent harvesting to be under an even-aged management regime.

For the purposes of this strategy, a mid to long term average harvest area of 1 600 ha/yr is assumed, that 90% or approximately 1 400 ha/yr is clearcut, and all clearcut areas are planted.

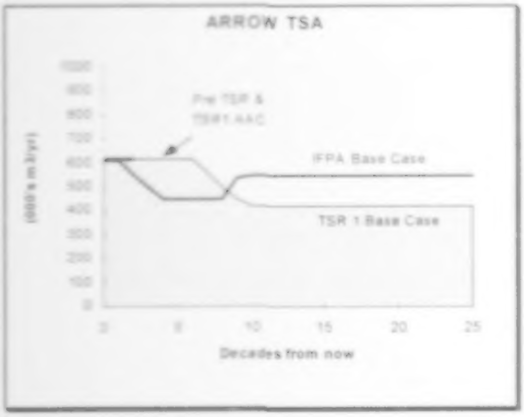
# 7. *Issues and Silvicultural Opportunities*

## 7.1 Discussion of Issues and Opportunities

TSA level modelling in support of silviculture planning has not yet been undertaken. At the TSA level, sensitivity analyses from the Arrow IFPA analysis report (Timberline, 1999) are the best available source of information as to the opportunities for incremental silviculture to increase future timber supply.

The following are selected sensitivity analsysis charts from this report. To the right of each chart is a brief discussion of the timber supply dynamics indicated by the chart, and associated silvicultural opportunities to influence these. In many cases, further modelling is required to confirm the indicated effects.

**Figure 2. IFPA vs TSR1 Base Case Harvest Forecast**



The TSR1 base case indicated the pre-TSR AAC could be maintained well into the future before a substantial drop to the long term harvest level would be required. (The provincial chief forester indicated in the TSR1 AAC determination that the TSR1 base case overstated the time that the initial harvest level could be maintained and that harvest levels may have to drop as early as the next determination.) The IFPA base case analysis indicates harvest levels must fall soon, but that long term harvest levels will be higher.

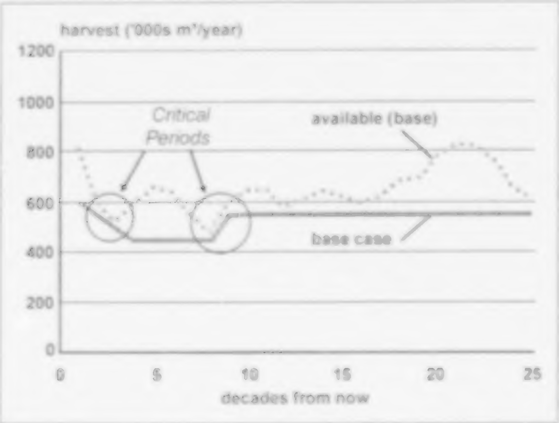
In the short term, there are 2 causes for the discrepancy between forecasts. One reason is that the IFPA net timber harvesting land base (THLB) is about 7% smaller than that of TSR1. A TSR1 sensitivity test of a 20% smaller land base indicated an immediate drop would be necessary, showing some similarity to the IFPA result.

The second reason for the discrepancy in short term forecasts is that the TSR1 analysis was pre forest practices code. It did not contain seral stage and watershed requirements that are part of the IFPA analysis.

In the long term, the TSR1 analysis used natural stand (VDYP) yields for regenerated stands, whereas the IFPA base case analysis used managed stand (TIPSY) yields. TIPSY yields are typically 20-30% above those of VDYP at the same age, which largely explains the discrepancy between the TSR1 and IFPA forecasts.

For the purposes of this interim silviculture strategy, it is assumed that the IFPA base case forecast is the most current and accurate information available.

**Figure 3. Timber Availability vs. the IFPA Base Case**



Timberline (1999) reports, "...it is highly unlikely that the base case harvest level is in fact operationally attainable." This is because the available volumes average only 25% more than the forecast harvest over the planning horizon. This indicates a very low "...degree of flexibility in actually locating the harvest operationally."

Increasing timber supply availability, as opposed to increasing the harvest forecast, is therefore an important objective for potential silviculture strategies. Timber supply is particularly critical in decades 3 and 8-9. Silvicultural options for decade 3 are limited, whereas there are significantly more management options for stands to be harvested in decades 8 & 9, these being among the first of the managed stands.

**Figure 4. Current Age Class Structure**

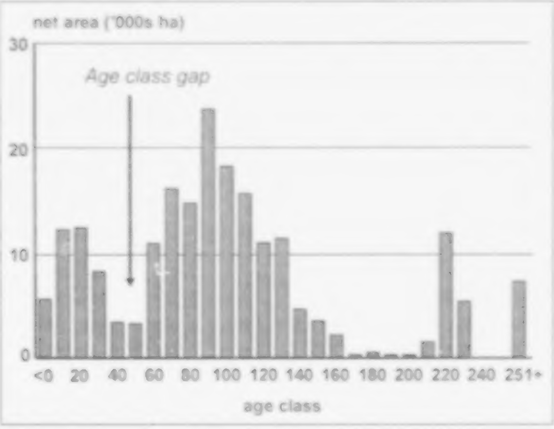
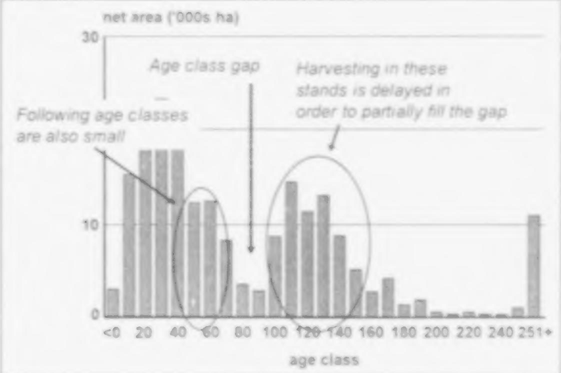


**Figure 5. Age Class Structure 40 Years From Now**



The current age class structure (Figure 4) shows a shortage of stands 31-50 years of age (age classes shown are the upper end of the age class).

Forty years from now (Figure 5), which is about the middle of the lowest level in the IFPA base case harvest forecast, the stands that are presently 31-50 years of age will then be 71-90 years old. The IFPA analysis report indicates a normal forest distribution would have about 16 000 ha's in each 10 year age class. Age classes 8-9 each have less than 1/4 this amount.

The next three age classes below age classes 8 & 9 are also not in plentiful supply. This makes them poor candidates for bringing forward to help fill the age class gap.

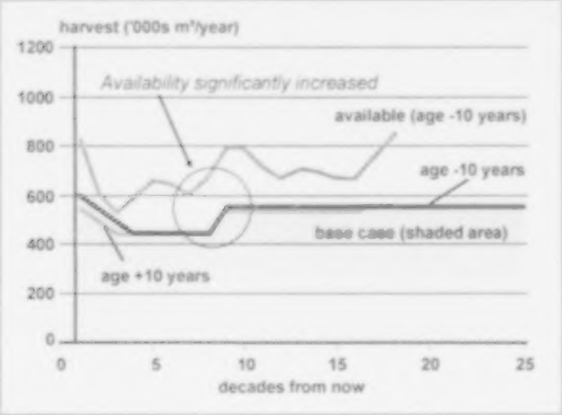
This age class gap drives the need to hold timber back from harvesting in the first 5 decades to avoid more serious mid term harvest shortfalls.

Potential mechanisms for filling in the mid term shortfall are:

- Increasing the volumes of the stands presently in age classes 3-6 through fertilization. (Most of these stands are too old for spacing. Some may be suitable for fertilization.)
- Advancing the productivity and merchantability of stands currently aged 1-20 years through a range of silviculture treatments.
- Partial harvesting or commercial thinning older stands that are otherwise unavailable for harvest at that time (i.e., stands that will be in age classes 10-14, 50 years from now). The volumes of some of these stands could be increased pre and/or post harvest by fertilization. ECA rules may limit this option.

(This likely has no implications for current silviculture activities.

### Figure 6. Sensitivity to Changes in Minimum Harvestable Ages and Implications for Timber Quality Management



IFPA minimum harvestable ages are based on attaining a min avg. stand DBH of 25 cm and a min vol of 150 m3/ha.. (Tline, 1999:12) The DBH criterion is one of the most onerous in the region.

| Species | Min Age by Site Class –managed. | | |
|---|---|---|---|
| | G | M | P |
| Exist Mangd (all sites) | | 90-110 | |
| F/Pl | 60 | 80-90 | 130-140 |
| F/S | 90 | 120-150 | 250-260 |
| S/Pl | 100-120 | 160-170 | 70-200 |
| Pl/F | 70 | 100-140 | 210-250 |

Minimum ages for G & M sites tend to be relatively close to culmination age. Min ages for poor sites (about 20% of the THLB), however, are well in excess of culmination age, sometimes by as much as 2X.

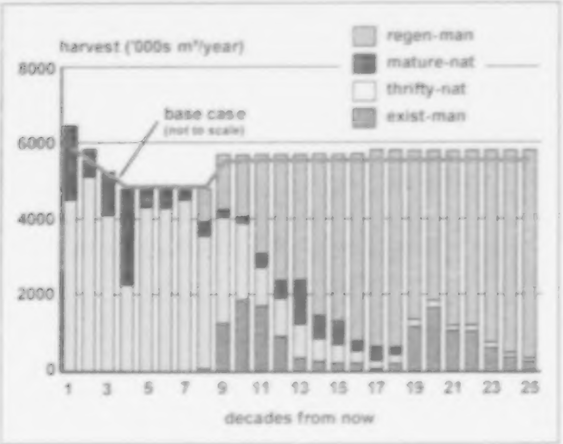
Lowering the minimum age by 10 years has no effect on the mid term shortfall (but significantly increases timber availability). The age class gap is 20 years wide and therefore lowering ages by 10 years is insufficient to span this gap.

Medium sites occupy about 2/3rd's of the THLB. Spacing these stands would significantly advance their minimum harvestable ages (see "Large Premium Log Analysis," page 61). Initial densities for managed stands in the IFPA analysis are 1 200 sph. No mention is made of the need for stocking control. District indicates potential of 600 ha/yr of spacing from 3 000 to 1 200 sph. W/O spacing, this ingrowth will significantly increase the time for avg stand DBH to reach 25 cm and therefore increases min ages.

Growing forests to older ages generally improves their quality. However, this chart indicates that delaying harvests for this purpose would lower harvest levels in the first several decades. This is because a greater area must be reserved from harvesting to avoid worsening the mid-term shortfall.

The objective of growing forests longer for quality may be more compatible over the long term, where increasing harvestable ages does not appear to affect harvest levels.

**Figure 7. The Transition From Existing to Managed Stands**

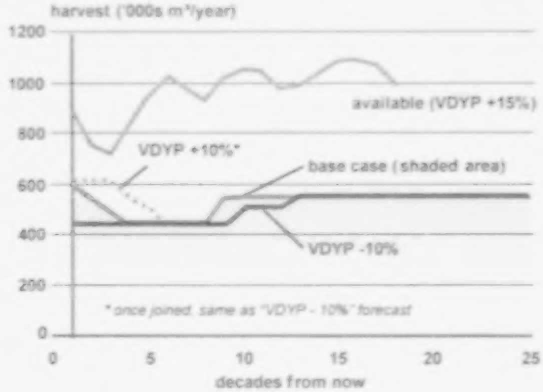


Because of forest cover constraints and long minimum harvest ages for medium and poor sites, the transition from existing to managed stands occurs gradually. Harvesting of regenerated stands actually occurs within the model in advance of existing managed stands (decade 8).

About 50% of the harvest is from managed stands in decade 9, rising to about 75% in decade 11. However, managed stand harvesting fall back temporarily to about 65% in decade 13. Harvesting is about 90% from managed stands by decade 16, and stays above this level thereafter.

By decade 9, the move into managed stands enables the harvest level to rise at this time. Other sensitivity tests (for example, see Figure 9) show the influence of the gradual transition to managed stands by increasing harvest levels later on in the planning horizon, usually at decade 13 (possibly because of the burst of harvesting in mature existing stands which will have higher volumes than the much younger managed stands).

**Figure 8. Sensitivity to Changes in Existing Stand Volumes**

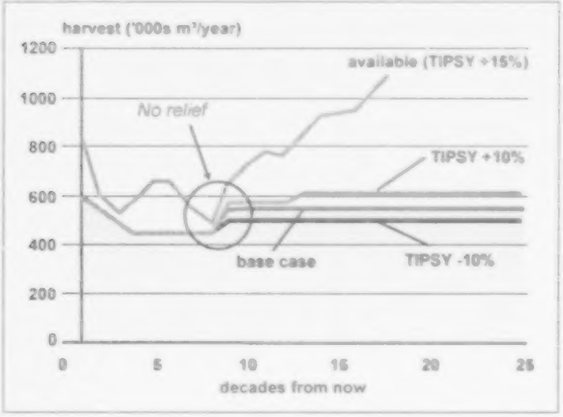


Lowering existing volumes 10% causes the starting harvest level to immediately drop to the mid term shortfall level. The significant lingering role of existing stands in decades 9-12 also causes harvest levels to drop in these decades.

Fortunately, a recent audit has indicated inventory stand volume estimates to be acceptable, so the base case is not at risk from lower estimates.

A 10% increase in existing stand volumes enables maintaining the initial harvest level a further 2 decades than in the base case. The TSA has a large fertilizable land base. Fertilization of suitable existing stands would increase their volumes and could contribute to increasing the timber supply in the short and mid terms.

**Figure 9. Sensitivity to Changes in Managed Stand Volumes**



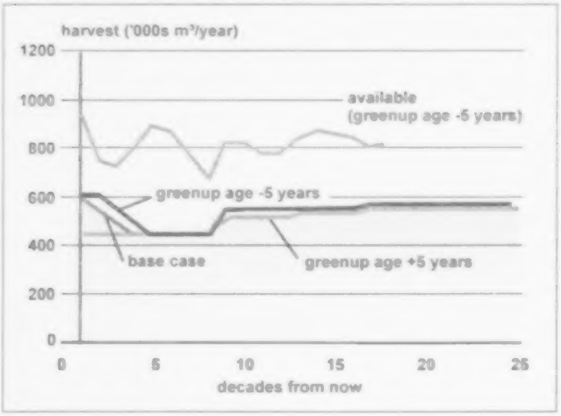
In the IFPA analysis, managed stands include existing Fdi stands less than 21 years old, all other existing stands less than 11 years old, and all future regenerated stands. (In the TSR2 analysis, spruce stands less than 21 years old, will also be defined as managed stands.) The volume of these stands is determined from TIPSY, using an OAF1 of 15% and an OAF2 of 5% (TLine, 1999:11). On average, managed stands have substantially more volume than existing natural stands of the same age. Managed stand volumes first become available for harvesting in decade 8, where about 20% of the harvest comes from these stands (see Figure 7).

Changing managed stand volumes by 10% results in corresponding changes in the long term harvest level (LTHL) from the base case, although because of the gradual transition from existing stands, the full effect of a 10% increase does not occur until decade 13.

A 10% increase in managed stand volumes does not relieve the extremely tight timber supply situation in decade 8. Managed stands comprise 20% of the harvest, so a 10% increase in managed stand volumes only increases timber supply by 2% in this decade.

Many silvicultural practices can be used to achieve an increase in managed stand volumes, including practices to reduce losses to root disease (which potentially are under-estimated in the IFPA base case but due to lack of time during the workshop individual root rot practices were not reviewed). An assessment of the stocking levels of stands in age classes immediately above the managed stand age cut-offs may show that more stands should be assigned the higher TIPSY yields than were done in the IFPA analysis.

**Figure 10. Sensitivity to Green-up Ages**



IFPA green-up heights and ages are as follows (Tline, 1999:8):

| Zone | % THLB | Ht | Age | %allowed below age |
|---|---|---|---|---|
| IRM | 85 | 2 | 14 | 25 |
| Wildlife | 19 | 2 | 14 | 25 |
| VQO* | 38 | 7/7/6 | 28/28/26 | 5/15/25 |
| Water | 46 | 9 | 34 | 15-25 |
| Sig.Streams | 31 | 9 | 34 | 25 |

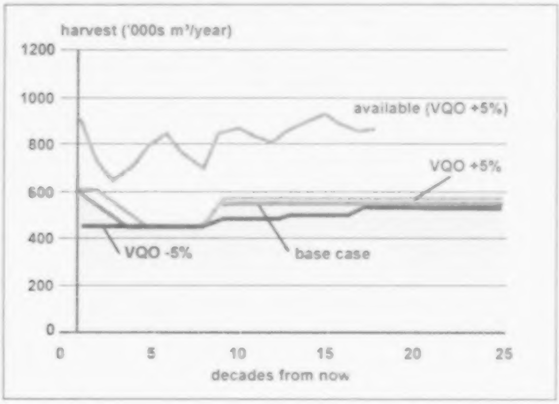
*retention/partial retention/modification

These ages represent current practice (Reichenback, 1996).

The IFPA sensitivity test indicates reducing time until green-up by 5 years results in extending the initial harvest level by 1 decade, but has little impact on harvest levels over the remainder of the planning horizon. Additionally, reducing green-up ages 5 years significantly improves timber supply availability over the entire planning horizon.

Reducing 2 m green-up ages by 5 yrs (from 14 to 9) would be very aggressive (although spruce and balsam are thought to achieve breast height much sooner than MoF estimates – see IFPA Forestry Plan, sec 3.3). Reducing 6, 7 & 9 m green up ages by 5 years is more achievable. Many silvicultural practices can be used to reduce the time until green-up. There is little risk to focusing on green-up issues in the short term, because these same practices will also serve to increase managed stand volumes. Figure 9 shows this would also be of considerable long term benefit.

**Figure 11. Sensitivity to Changes in VQO Forest Cover Constraints**



| VQO Zone | % THLB | Ht | Age | %allowed below age | Rotation |
|---|---|---|---|---|---|
| Retention | 5 | 7 | 28 | 5 | 560 |
| Part Ret. | 30 | 7 | 28 | 15 | 187 |
| Mod'n* | 3 | 6 | 26 | 25 | 104 |

* modification

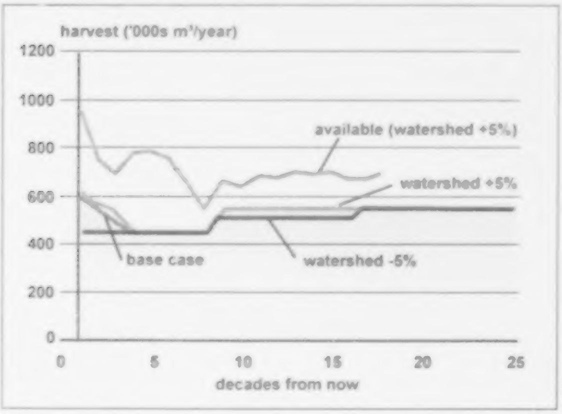
*The retention VQO requirement is so high that about ½ the stands in this zone cannot be harvested within the planning horizon.*

Lowering the area allowed to be not greened-up in VQO zones by 5% results in the immediate lowering of the initial harvest level to the shortfall level. This is because *the retention VQO zone (5% of the THLB) is eliminated from timber harvesting*, while timber availability in the partial retention zone, which covers 30% of the THLB, is cut by 1/3 (from 15% to 10%). The long term is also significantly affected from decade 9 to 17.

Relaxing VQO forest cover requirements by 5% is mathematically different from tightening by 5%, so would not show the same impact. As with all sensitivity tests, a relaxation only shows increased harvest levels up until another constraint becomes limiting. A 5% relaxation extends the time the initial harvest level can be maintained by 1 decade (from 1 to 2) and slightly increases LTHL. Alternatively, timber availability is significantly increased. This increase is likely caused mostly by relaxing constraints in the retention VQO and partial retention VQO zones.

A positive response to a relaxation of an area constraint generally shows an opportunity for partial harvesting or commercial thinning, whereas a positive response to reduced green-up ages points to silvicultural opportunities to achieve green-up sooner.

## Figure 12. Sensitivity to Changes in Watershed Forest Cover Constraints



*Note: Equivalent Clearcut Area (ECA) rules apply in watersheds. These rules acknowledge that hydrologic recovery occurs gradually, with 50% recovery occurring by 5 m stand height. Use of ECA rules in IFPA modelling would likely have made watershed requirements less restricting.*

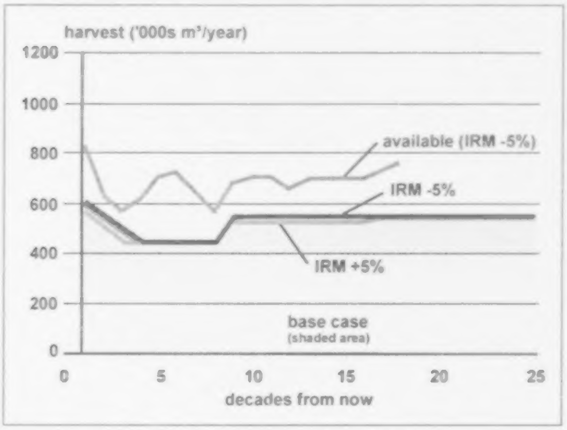
| H2O Zone | % THLB | Ht | Age | %allowed below age | Rotation |
|---|---|---|---|---|---|
| Class 1 | 8 | 9 | 34 | 15 | 227 |
| Class 2 | 4 | 9 | 34 | 20 | 170 |
| Class 3 | 16 | 9 | 34 | 25 | 136 |
| Comm* | 18 | 9 | 34 | 20 | 170 |
| Sig. Strm** | 31 | 9 | 34 | 25 | 136 |

*community watershed ** regionally significant streams

Lowering the area allowed to be not greened-up in watershed zones by 5% results in the immediate lowering of the initial harvest level to the shortfall level. This is because timber availability in the various zones, which cover up to 30% of the TSA, is cut by 1/3rd to 1/5th, depending upon the zone. The long term is also significantly affected, until about decade 17.

Allowing 5% more area to be not greened-up has only minimal impact on the base case harvest forecast. Alternatively, a 5% relaxation significantly improves availability in decade 3 indicating a potential for partial harvesting or commercial thinning about this time.

## Figure 13. Sensitivity to Changes in the IRM Zone Older Forest Constraint



*Note: Older forest requirements can be partially met by forests that are outside the THLB. FSSIM, the model used in the IFPA analysis, ages but does not regenerate forests outside of the THLB. This overestimates the ability of these forests to meet the older forest cover requirements and consequently likely underestimates the amount of older forest required to be maintained within the THLB. While every TSA is different, a sensitivity test in the Golden TSA indicated a possible 10% reduction in LTHL when the ages of forests outside the THLB were not changed over time.*

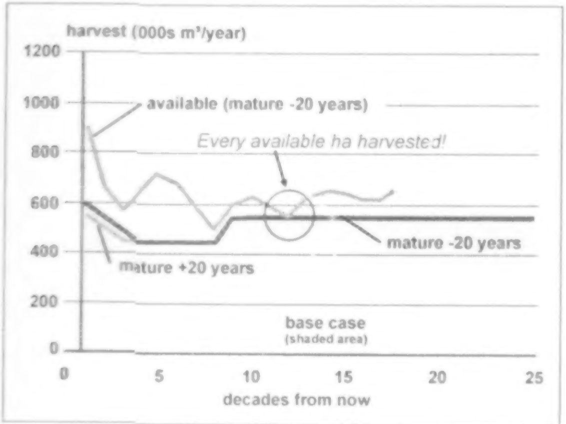
The IFPA base case older forest constraint requires 70% of the IRM area to be at least 40 years old at all times. The IRM zone covers 85% of the THLB and 90% of the productive forest area.

Increasing the requirement to 75% (IRM + 5% line) further restricts timber supply in the first 3 decades and in decades 9-17. Decreasing the requirement so that only 65% (IRM – 5% line) of the IRM zone must be above 40 years of age has no effect. Alternatively, decreasing the requirement marginally improves timber availability.

Silvicultural practices such as fertilization and commercial thinning may be used to accelerate stand structure so that the desired older forest attributes are achieved at an earlier age. However, this sensitivity test indicates there would be little benefit gained in terms of increased timber supply because the older forest constraint is not limiting.

±10% changes in the area required to be in older forests in the wildlife zones produces similar results to those shown in Figure 13, except that decades 9-17 are unaffected.

**Figure 14. Sensitivity to Changes in the Mature Seral Age Definition**



*See note opposite Figure 13.*

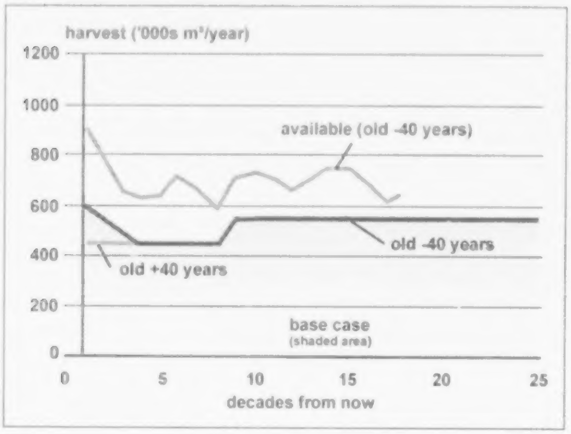
*The proportion of area to be in each biodiversity emphasis is not stated in the Timberline report. The Landscape Unit Planning Guide and the Biodiversity Guidebook suggest 45-45-10% of a management unit should be in low-med-high biodiversity emphasis zones respectively.*

The mature + old seral requirements used in the IFPA analysis are approximately 17% of low, 34% of medium and 50% of high biodiversity emphasis areas must be in stands aged 120+ yrs in the ESSF and in stands aged 100+ yrs in the ICH and IDF biogeoclimatic zones. This requirement can be met from the entire productive forest land base at the biogeoclimatic variant level within each landscape unit. Because this requirement can be partially satisfied from outside the THLB, the net requirement from within the THLB is often less than the percentages given.

Raising the mature seral age requirement by 20 years (to 140 yrs for ESSF or 120 years for other zones) reduces timber supply in the first 3 decades but otherwise does not affect the base case. Lowering these ages (to 100 or 80 yrs) *should* free up timber supply but instead appears to reduce availability. (Timberline does not provide an explanation as to why availability decreases.) The base case mature seral stage requirements do not have a large impact on timber supply because the highly restricted green-up area requirements as well as the poor-site minimum harvest age requirements cause a significant area to be held in older forests.

Silvicultural practices such as fertilization and commercial thinning may be used to accelerate stand structure so that the desired older forest attributes are achieved at an earlier age. However, this sensitivity test indicates there would be little benefit gained in terms of increased timber supply from this factor alone. The composite scenario (Figure 20, page 29), on the other hand, indicates that considerable gain my occur when relieving this factor is combined with relieving other factors at the same time.

**Figure 15. Sensitivity to Changes in the Old Seral Age Definition**



*See note opposite Figure 13.*

*See note opposite Figure 14.*

The following are approximations of the biodiversity requirements applied in the IFPA analysis (Tline, 1996:8-9). The IFPA old seral requirements for the low biodiversity emphasis areas are phased in over 3 rotations, ultimately requiring about 13% of stands to be older than 250 yrs of age (140 yrs in NDT3 areas).

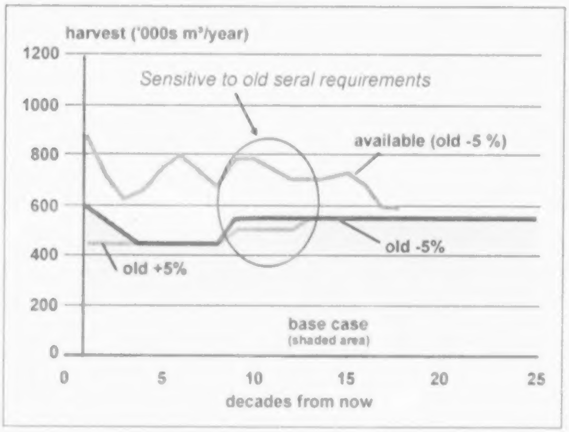
| BDV emphasis | low | med | high |
|---|---|---|---|
| min % aged 250+ | 4⇒13 | 13 | 19 |

This requirement can be met from the entire productive forest land base at the biogeoclimatic variant level within each landscape unit. Therefore, the net requirement from within the THLB is often less than the percentages given.

Raising the old seral age definition by 40 years (to generally 290 yrs) reduces timber supply in the first 3 decades but otherwise does not affect the base case. Lowering these ages by 40 years (to generally 210 years) increases availability. Except in the short term, the base case seral stage requirements do not have a large impact on timber supply because the highly restricted green-up area requirements indirectly cause a significant area to be held in older forests.

Silvicultural practices such as fertilization and commercial thinning may be used to accelerate stand structure so that the desired older forest attributes are achieved at an earlier age. However, this sensitivity test indicates there would be little direct benefit gained in terms of increased timber supply but would indirectly increase overall availability. The composite scenario (Figure 20, page 29) indicates that considerable gain my occur when relieving this factor is combined with relieving other factors at the same time.

**Figure 16. Sensitivity to Changes in the Old Seral Area Requirement**



*See note opposite Figure 13.*

*See note opposite Figure 14.*

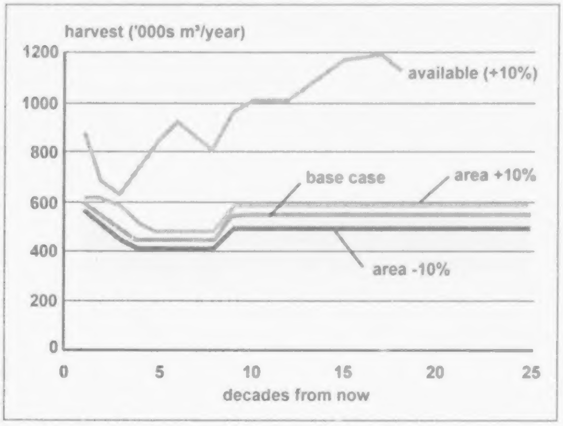
The following are approximations of the biodiversity requirements applied in the IFPA analysis (Tline, 1996:8-9). The IFPA old seral requirements are phased in over 3 rotations in the low biodiversity emphasis areas, ultimately requiring about 13% of stands to be older than 250 yrs of age (140 yrs in NDT3 areas).

| BDV emphasis | low | med | high |
|---|---|---|---|
| min % aged 250+ | 4⇒13 | 13 | 19 |

This requirement can be met from the entire productive forest land base at the biogeoclimatic variant level within each landscape unit. Therefore, the net requirement from within the THLB is often less than the percentages given.

While increasing the old seral age requirement had no effect on decades 9-13 of the harvest forecast (see Figure 15), increasing the area requirement by 5% has a significant effect during this time. Decreasing the area requirement by 5% does not allow an increase in harvest levels, but does improve availability. Green-up area requirements as well as minimum harvest ages are likely limiting any possible rise in harvest level.

**Figure 17. Sensitivity to Changes in the Size of the Timber Harvesting Land Base**



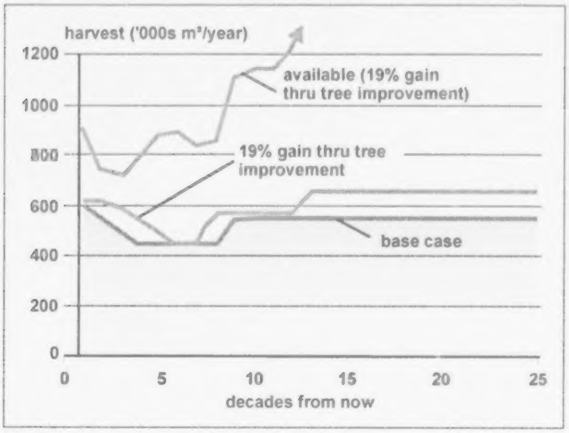
Increasing or decreasing the THLB by 10% correspondingly affects the harvest forecast over all periods. Silvicultural practices may be used to increase the size of the THLB through conversion of un-utilized stands to merchantable species and to increase the productivity of low sites.

Opportunity area consists of the areas deducted from the IFPA THLB. These include (Tline, 1996:3,5)

| Type | Area | Equiv % THLB | Reference |
|---|---|---|---|
| Low site | 1 800 | 1.7 | Table 5, p5 |
| Decid | 8 300 | 4.1 | Table 6, p5 |
| Non Merch | 3 100 | 1.5 | Table 6, p5 |
| Fume kill | 500 | 0.2 | workshop |

70% of the 2 000 ha of backlog NSR were assumed in the IFPA base case to be restocked within the next 10 years, with the other 30% restocked in 20 years. Two stocking classes were used with the breakpoint being 400 sph. Recent district estimates indicate that about ½ of this is inaccessible or uneconomic to treat, indicating the IFPA base case may be slightly optimistic (see "Incremental Silviculture History," page 16). Currently, there are about 400 treatable ha of backlog NSR.

Figure 18. Tree Improvement Program Potential



Greater yields resulting from tree improvement were modelled in the IFPA analysis by:

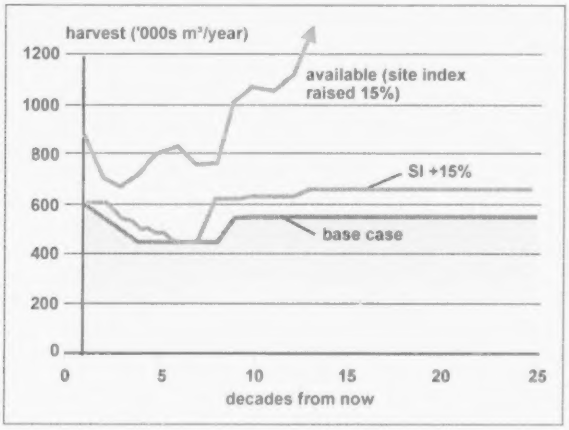
- increasing regenerated stand yields 19%;
- reducing green-up ages by 1, 3 and 5 years for 2, 7 and 9 m green-up hts respectively; and
- reducing minimum harvest ages by a range of 10 to 90 years.

(See discussions of: green-up ages - Figure 10; minimum ages - Figure 6; and increased regenerated stand yields - Figure 9.)

Note that neither this scenario nor the site productivity scenario (Figure 19) can entirely eliminate the mid term shortfall.

(Workshop analysis indicated tree improvement may yield a 7% LTHL gain (vs 19% used in the IFPA analysis) based on the current program. This lower estimate would not result in the lower green-up and minimum ages used in this sensitivity test.)

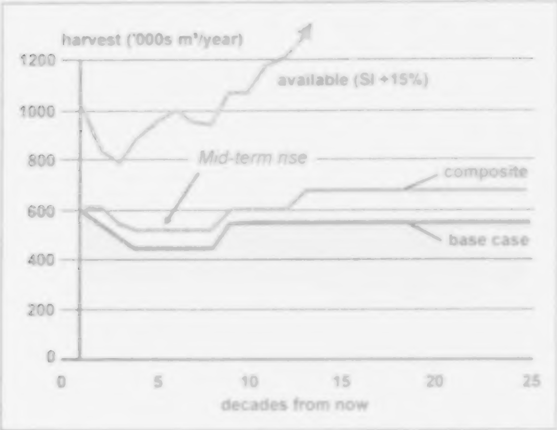
Figure 19. Potential of Improved Estimates of Site Productivity



Increased site productivity estimates were approximated by increasing all managed stand yields by 15%. A higher response is seen in decades 8-12 because the increased yields were also applied to existing managed stands (these stands do not have increased yields in the improved tree scenario in Figure 18 because they did not originate from improved seed.). Similar changes to green-up ages and minimum harvest ages were applied as in Figure 18.

(Workshop analysis indicated a higher site productivity gain than was used in the IFPA analysis may be likely. This may offset the workshop's lower expected result from the tree improvement program compared to the IFPA analysis.)

Figure 20. Composite scenario



The composite scenario incorporates a small land base increase, a 15% site index improvement and a 5% relaxation of mature + old and old growth seral stage requirements.

This is the only sensitivity test that indicates a potential rise in harvest levels across the entire mid term shortfall period. The underlying fundamentals of the changes that drive this composite scenario forecast indicate that all three constraining factors must be moved at the same time; i.e., green-up must be achieved sooner, merchantable timber sizes must be achieved at younger ages, and older forest requirements must either be relaxed or achieved in some other way.

## 7.2 Summary of Issues and Silvicultural Opportunities

### *7.2.1 Modelling/Data Factors*

The following modelling methodologies or data estimates will likely have an effect on the forecasts:

- Ageing but not regenerating stands outside of the THLB likely underestimates the amount of older forest that must be maintained within the THLB and therefore likely overestimates LTHL.
- Improved site productivity estimates are likely to result in greater yield increases than used in the analysis.
- Given present tree improvement program plans, yields from improved trees will be lower than those used in the analysis (about 7% vs 19% used).
- The use of ECA rules in watersheds would likely ease the overall green-up requirements associated with watersheds. Sensitivity tests indicate the effects may be minimal.
- Minimum harvest ages are based on the demanding criteria of an average 25 cm DBH. This results in very high minimum ages for poor site stands. Lower minimum harvest ages may result in the older forest requirements becoming more limiting.
- In the retention VQO zone (5% of the THLB) a 5% green-up area limit coupled with a 28 year green-up age results in over half of the area never being harvested during the planning horizon (560 years to harvest all stands vs a 250 yr planning horizon). This is effectively a 2½% reduction to the THLB.

### 7.2.2 General Synopsis

As pointed out by Timberline in its IFPA analysis, the base case harvest forecast is not likely to be operationally attainable, *unless either or both of the tree improvement or site productivity scenarios become a reality*. Even then, achieving the indicated harvest levels over the next 5 to 6 decades will likely be difficult. Consequently the goals of a silvicultural strategy should be to: first, minimize the anticipated harvest level reductions; and second, to increase the overall availability of timber supply in this time period.

At least three different base case constraints force the model to harvest stands at older ages, or conversely force the model to harvest younger stands when older forests are unavailable. Minimum harvest ages for some medium-site stands are as high as 170 years and for some poor-site stands are as high as 250 years. Green-up constraints in the retention VQO zone *may cause some stands to never be harvested within the planning horizon*, and in the partial retention zone (30% of the THLB) delays harvesting of some stands until they are over 180 years of age. Green-up constraints in the watershed zones can cause delays until 170 years (Class 2 and Community watersheds). Lastly, old seral state requirements also require significant areas to be held in older forest.

All of these constraints are very tightly bound. The most binding are the VQO and watershed zone green-up forest cover requirements, followed closely by older forest and biodiversity requirements. When one requirement category is relieved in a sensitivity test, changes in the harvest forecast are almost immediately (if not already) limited by the other. Conversely, when a requirement is increased, the harvest forecast invariably drops, usually immediately. It seems apparent that measurably increasing timber supply or at a minimum increasing the general availability of timber supply at the base case forecast level, requires relieving both green-up and older forest requirements as well as lowering minimum harvest ages. This is demonstrated by the composite scenario in Figure 20.

Silvicultural practices can be used to reduce the time until green-up heights are achieved. While silvicultural practices cannot reduce the time at which older forest ages are achieved, they can be used to develop the stand structure of older forests at younger ages. Not all desired characteristics of older forests may be achieved in this fashion, however.

Another defining characteristic of the timber supply is the shortage of stands currently 21 to 60 years of age (acutely 31-50). This "age class gap" contributes to a mid term harvest shortfall below the long term harvest level. While some sensitivity tests showed results that narrowed the length of time of the shortfall period, no sensitivity test was able to overcome the shortfall across the entire shortfall period. Only the composite scenario resulted in raising the harvest level across the entire shortfall period, but it was not able to completely eliminate the shortfall.

Compared to most other TSA's, the Arrow TSA does not have an abundance of older forests. This factor contributes to the sensitivity in the first 3 decades and in decades 9 – 17 to increases in constraints that reduce the availability of older forests.

Many of the constraints imposed are crude surrogate measures used in the absence of better information. Before spending huge sums in silvicultural programs to mitigate the impacts of the constraints, it may prove wiser to first improve the research and assumptions behind the constraints to determine their appropriateness. Habitat supply modelling could be useful in this regard.

In a similar vein, much of the Arrow TSA lies within the Interior wet belt and contains highly productive forests. This productivity does not seem appropriately represented in the IFPA analysis. Again, improving the information base might be an appropriate first step before spending large sums on silvicultural programs.

### 7.2.3 *Limitations of Available Information*

The disparities between the TSR1 and the IFPA analyses and the data/modelling limitations discussed on page 29 are evidence that timber supply forecasts must be used cautiously in silviculture planning. Stand level models are used to predict yields that are then used in the TSA level model. The probability of the exact sequence of harvested ages and stands that the TSA model selects to form a harvest forecast actually occurring is virtually nil. Yet certain features of the TSA can be expected to hold consistent across both present and future analyses. Such features should be the primary focus of a silviculture strategy. These features in the Arrow TSA are:

1. A physical scarcity of timber in the short term, somewhat related to a lack of stands currently 21 to 50 years of age.
2. Increases in yields of managed stands will directly translate into increases in long term harvest levels.
3. Time until green-up heights are reached will continue to be a limiting factor, particularly in VQO zones (watershed zones require re-analysis under ECA rules to confirm the role of green-up ages in those zones).
4. Older forest requirements will be very tight, if not outright limiting.

While all factors can be influenced by silvicultural actions, the third and fourth factors can also can be influenced by policy changes.

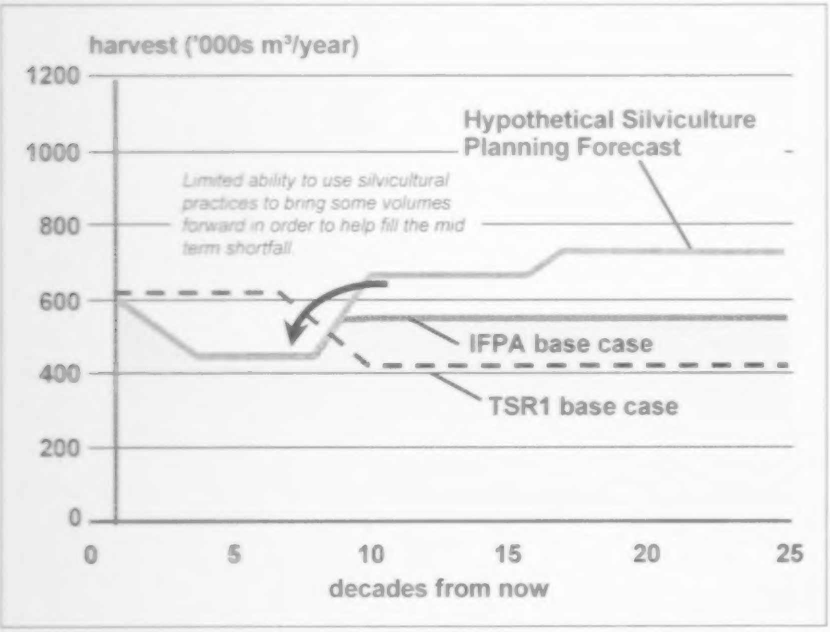
### 7.2.4 *The Silviculture Planning Harvest Forecast*

To ensure the appropriateness of silvicultural strategies, it is necessary to hypothesize a "most likely" harvest forecast. This silviculture planning harvest forecast is often different from the TSR base case harvest forecast because it incorporates some speculation about factors that may affect estimates of future timber supply. In the TSR process, such factors are addressed through sensitivity analyses. If the sensitivity does not affect short term harvest levels, it is usually considered not relevant to an AAC determination and the base case is left unchanged. However, such factors may be highly relevant to silviculture planning which, unlike the AAC determination process, is more focused on the future than on the present.

Figure 21 below illustrates the silviculture planning harvest forecast for the Arrow TSA. This forecast takes into account the items noted under "Modelling/Data Factors," page 29 and was confirmed in the district workshop. For the purposes of this interim silviculture strategy, it is assumed that future timber supply forecasts will likely show declining harvest levels over the next several decades, similar to the IFPA base case forecast. This reflects the physical short term scarcity of timber in the TSA which is an adjunct to a transition from a natural forest to a managed, but diverse, forest. The shortage of stands presently aged 21-60 years will continue to be a significant factor, contributing to the mid term shortfall period of the forecast. Future long term harvest levels (LTHL) are expected to be significantly above the TSR1 and IFPA base case forecasts. Higher managed stand yields, improved estimates of site productivity and the volume gains resulting from tree improvement programs, will more than offset any potential reductions that may be needed in order to maintain more area in an older forest condition.

The significant feature of the silviculture planning harvest forecast is the higher long term harvest level. Unfortunately, there is limited opportunity to move some harvest volume forward in time to help fill the mid term shortfall because stands currently aged 1 – 20 years are themselves not overly abundant.

**Figure 21. Silviculture Planning Harvest Forecast**



Factors that are likely to influence the harvest forecast, but are not certain and are subject to changes in rules are:

- old growth constraints, which may particularly impact decades 8-17; and
- green-up constraints.

While these two factors can be planned for in this strategy, confirmation of their importance to the harvest forecasts must await further analysis.

### 7.2.5 *Future Timber Volumes (Quantity)*

Short Term (1 - 20 years)

The short term period is somewhat arbitrarily defined as the next 20 years.

The TSR2 base case is likely to indicate that harvest levels cannot be maintained at the current AAC throughout the short term period (see Figure 21).

In the IFPA analysis, short term harvest levels are largely governed by the need to have a relatively smooth transition down to an unavoidable low point in the harvest forecast.

Short term timber supply therefore may benefit from:

1. activities that will reduce the critical shortages in decades 4 to 8;
2. activities that will overcome currently experienced adjacency constraints, such as large patch cuts, partial harvesting and commercial thinning, provided they do not further lower harvests in the mid term; and
3. activities that will increase the volume to be harvested in this time period, such as:
    - (a) harvesting and recovering merchantable volumes from stands currently classified as non-merchantable, such as deciduous stands or decadent coniferous stands;
    - (b) late rotation fertilization of suitable stands in advance of clear-cut harvest or following partial harvesting);
    - (c) harvest from other areas, such as environmentally sensitive areas (ESA's), in a manner that meets the objectives for which the areas were originally set aside (replace ESA soils mapping with terrain stability mapping?); and
    - (d) harvest from areas currently considered inoperable.

The allocation of the potential benefit from the above activities is a matter of allowable annual cut policies and determinations. Under current policy, an increase in short term harvest level above the current level is highly improbable. Rather, it is likely that any benefits will be allocated:

- first, to maintaining the current harvest level for another 5-10 years, provided this does not further worsen forecast future harvest level reductions;
- second, to eliminating the mid term shortfall (below LTHL); and
- last, to extending the current harvest level beyond 10 years.

For this reason, all of the above, except item 3 are considered potential mid-term strategies. Of those listed under item 3, only (a) and (b) are silviculture related.

### Mid Term (21 - 80 years)

The mid term period begins at the end of the short term period (i.e., 21 years from now) and continues until the transition from harvesting in existing natural stands to harvesting mainly in 2nd growth managed stands is complete. In the Arrow TSA IFPA forecast, about half of the harvest volume in decade 9 is from managed stands (decade 9 is the period 81 to 90 years from now). However, even though a steady long term harvest level is reached in decade 9, it is not until about the 13th decade that harvesting is about 90% in managed stands. For the purposes of this strategy, the end of the transition period is assumed to be 80 years; i.e., at the end of decade 8.

The mid term is governed by the need to extend existing timber supply to cover what appears to be critical shortages in decades 4 to 8. Mid term timber supply will benefit indirectly from the movement of any additional timber supply that may be created under the short term strategies into the mid term.

Mid term timber supply may directly benefit from:

1. setting up stands for activities that will overcome adjacency constraints that may exist in the mid term, such as partial harvesting and commercial thinning;
2. activities that will achieve-green-up earlier in the VQO and watershed zones, so that green-up is not limiting on the ground;
3. setting up stands now to meet older forest requirements in that period; and
4. activities that will increase the volume of stands to be harvested in this time period, particularly in decades 4 to 8, such as:
   (a) fertilization of suitable stands;
   (b) commercial thinning volumes from stands that otherwise will be harvested later during the long term (i.e., bring volumes forward from the long term); and
   (c) spacing and fertilizing younger existing stands and newly regenerated stands to lower make them merchantable sooner (i.e., effectively lower their minimum harvestable ages).

Long Term (81 + years)

The long term period is the time when harvesting is primarily in managed 2nd growth stands and is characterized by a steady state harvest level. In the Arrow TSA, this point is reached in decade 9 of the IFPA analysis which begins 81 years from now.

The long term is assumed to be sensitive only to changes in managed stand volumes, the size of the timber harvesting land base, and the amount of losses to root rot diseases. It is assumed that stands will be harvested at ages that are near biological rotation ages and that harvesting stands below these ages will not be occurring.

### 7.2.6 *Future Timber Quality*

To date there has been little attention to the matter of future timber quality. The focus of the timber supply review on AAC determination has resulted in the planning emphasis being solely on timber volumes. Until recently, there has been little higher-level policy guidance with respect to managing for future timber quality.

Using age as a surrogate measure of timber quality, the expected decline in harvest ages towards lower harvestable ages during the mid term indicates future timber quality will be substantially lower than today's. Quality levels will recover somewhat in the long term with the trend towards older forests. Other than areas affected by root rot, most harvested second growth timber will be sound wood with little or no decay.

Smaller diameter material is not necessarily all negative in terms of timber quality. There is some evidence that slower grown, smaller diameter lodgepole pine produces a better proportion of machine stress rated (MSR) lumber, which currently commands a higher price than standard grade lumber.

If a 'clear' log is defined as one having at least 25% clear lumber content (based on coastal log grading rules), then 2nd growth forests will have few if any such logs. Pruning will be necessary if future standing inventories are to contain any clear log content.

Lower quality stands present some future market risk. In low market periods it is often only the readily accessible, higher-quality timber that is profitable to harvest. Also, a narrow portfolio of small diameter timber offers less opportunity for creating a range of value-added forest products.

Timber quality can be improved through silviculture practices such as spacing, fertilization and pruning. Portions of the TSA are suited to growing white pine trees, a singularly valuable species that currently commands premium prices.

# 8. *Opportunities to Increase Timber Supply*

## 8.1 Potential Silviculture Strategies

Prior to the district workshop, information in the previous sections was used to identify the following potential silvicultural strategies for either maintaining or increasing future timber supply at the TSA level. Each of these was discussed in detail in the district workshop, the results of which are recorded in "Workshop Review of Potential Strategies," page 39, along with additional strategies that arose during the meeting. Strategies that are ultimately adopted are noted in "Silviculture Strategies," page 67.

### *8.1.1 Short Term (1 - 20 yrs)*

ST 1: Harvesting and recovering merchantable volumes from (increase)[3]:

(a) _______ ha's deciduous stands;

(b) _______ ha's of coniferous stands currently classified as non-merchantable; and

(x) _______ ha's of ESA's (not a silviculture strategy);

(x) _______ ha's of forests currently classified as inoperable (not a silviculture strategy).

ST 2: Late rotation fertilize ____ ha/yr of suitable stands scheduled for harvest in the 2nd decade to increase their volumes. (increase)

ST3: Utilize large patch cuts to emulate stand replacing fires (also overcomes adjacency?) (increase)

ST 4: Achieve green-up earlier in existing managed stands currently aged 1-20 years in the watershed (9m green-up) and VQO zones (6-7 m green-up) by (increase – this is a subset of MT5):

(a) brushing ____ ha/yr for growth enhancement (in addition to ___ ha/yr to ensure free growing; and

(b) spacing ____ ha/yr of pine stands (priority - those subject to repression);

(c) spacing ____ ha/yr of Douglas-fir stands (prioity – those subject to seasonal moisture deficits); and

ST5:

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[3] (Increase) means oriented to increasing harvest levels above those indicated by the TSR2 base case. (Maintain) means oriented to maintaining the harvest level indicated by the TSR 2 base case.

### *8.1.2 Mid Term (21 - 80 yrs)*

MT 1: Late rotation fertilize ____ ha/yr of suitable 71 to 100 year old stands scheduled for harvest 20 to 80 years from now to increase their volumes (continuation of ST 2). (increase)

MT 2: Repeat fertilize stands presently 21 – 60 years old to increase their volumes at harvest. (increase)

MT 3: Reduce the minimum harvest ages of stands presently 1 – 20 years old by: (increase)

(a) brushing ____ ha/yr for growth enhancement (in addition to ___ ha/yr to ensure free growing;

(b) spacing ____ ha/yr of pine stands (priority - those subject to repression);

(c) spacing ____ ha/yr of Douglas-fir stands (prioity – those subject to seasonal moisture deficits); and

(d) repeat fertilizing ____ ha/yr.

MT 4: Investigate stocking levels of stands of Fdi, 21-30 yrs of age and of all other species 11-30 yrs of age.

MT 5: Reduce green-up ages of about-to-be-regenerated stands by 8 years in the VQO (base case - 28 yrs to 7 m ht) zone and by 10 years in the watershed zones (base case - 34 yrs to 9 m ht) by: (increase)

(a) site preparing ___ additional hectares;

(b) using improved seed;

(c) using larger planting stock;

(d) planting white pine wherever suitable;

(e) fertilizing at time of planting;

(f) brushing ____ ha/yr for growth enhancement (in addition to ___ ha/yr to ensure free growing; and

(g) spacing ____ ha/yr of pine stands (priority - those subject to repression);

(h) spacing ____ ha/yr of Douglas-fir stands (prioity – those subject to seasonal moisture deficits); and

(i) repeat fertilizing ____ ha/yr.

MT 6: Set up stands presently 60 – 100 years old for future partial harvesting/ commercial thinning in the VQO and watershed zones by:

(a) commercial thinning to recover small diameter products; and

(b) repeat fertilizing ____ ha/yr.

MT 7: Increase the area satisfying mature forest biodiversity requirements in decades 8-13 by achieving the desired stand characteristics by 100 years of age by:

(a) spacing ____ ha/yr; and

(b) repeat fertilizing ____ ha/yr.

### 8.1.3 *Long Term (81+ yrs)*

LT 1: Maintain the THLB by:

(a) Planting ____ ha of backlog NSR; and

(b) Maintaining ____ ha of existing backlog plantations.

LT 2: Increase the THLB by:

(a) converting/rehabilitating ____ ha/yr of deciduous stands; (increase)

(b) converting/rehabilitating ____ ha/y of non-merchantable ____?____ stands; (increase)

(c) assessing _______ ha of low-site stands for proper classification; or

(d) improve the site productivity of low-site stands by _________ (fertilization?). (increase/maintain)

LT 3: Increase regenerated stand volumes by, in addition to those practices in MT 5:

(a) managing stocking so voids do not account for more than 10% of the area (increase); and

(b) repeat fertilize _____ ha/yr on a 15 yr return cycle (increase).

LT 4: Reduce losses to root rot by: (increase)

(a) pushover logging/stumping _____ ha/yr;

(b) planting alternate/mixed species on ______ ha/yr;

(c) pop-up spacing on _____ ha/yr; or

(d) small diameter spacing.

LT 5:

LT 6:

LT 7:

## 8.2 Workshop Review of Potential Strategies

### *8.2.1 Introduction*

Potential strategies were reviewed in the workshop according to the response time frames of short, mid and long term time periods. Each response time frame is the period in which the anticipated result of a potential strategy is expected, not the period in which actions must necessarily commence.

Workshop discussions are documented in the following tables. The contents of each column are further described below.

| Column Number | Note |
|---|---|
| 1 | Strategy numbers correspond with the numbers recorded earlier in "Potential Silviculture Strategies," page 36. Items followed by an asterisk (*) were added during the district workshop. |
| 2 | Information is largely from the district workshop, combined with information presented earlier in this document. |
| 3 | Anticipated results are calculated using a variety of methods. |

At the end of each time period is a summary of the anticipated responses for all strategies proposed for the period. A potential harvest forecast is prepared under this summary. This forecast is highly speculative and requires confirmation through computerized management unit level analysis.

### 8.2.2 *Short Term (1 - 20 years)*

| Number | Potential Strategy/Action | Discussion / Current Status | Antic |
|---|---|---|---|
| ST 1 | 1. Harvesting and recovering merchantable volumes from (increase)[4] | 1. The listed items have potential to immediately increase timber supply through the harvesting of standing timber. They also have implications, where there is no merchantable timber, for the development of silviculture rehabilitation plans and, in all cases, for expanding the timber harvesting land base. | |
| ST 1 | (a)_______ ha's deciduous stands; | (a) About 8 300 ha's of deciduous stands were deducted during the TSR2 THLB netdown process. Mostly birch, but some aspen. Because Kalesnikoff Lumber has birch lumber sitting in its yard that it cannot sell, the market potential for harvested deciduous appears bleak. See LT 2 regarding rehabilitation potential for deciduous stands. | (a) No opportunity. |
| ST 1 | (b)_______ ha's of coniferous stands currently classified as non-merchantable; | (b) About 3 100 ha's of the following forest types were deducted during the IFPA THLB netdown process. Percentage deductions are shown in brackets.<br>• CH > 140 yrs (50%)<br>• H > 140 yrs (40%)<br>• B, BH > 140 (10%)<br>• BH > 250 (100%)<br>• Pl 220 > 100 (100%).<br>The potential for these areas to contribute to meeting old growth management area objectives needs to be determined before they should be considered for harvesting or rehabilitation. Noted under "Summary of Information and Research Needs," page 75. See also LT2. | (b) Further info required. |
| ST 1 | (x1) _______ ha's of ESA's (not a silviculture strategy); | (x) About 32 200 ha (outside watersheds) and 11 500 ha (inside watersheds) of environmentally sensitive areas (ESA's) were deducted during the netdown process. Of this, about 26 000 ha is attributable to sensitive soils and 3 000 ha to regeneration difficulty. Some of these areas can hold significant timber volumes. Terrain stability mapping can be used to fine tune areas classified into ESA. The need to compare TSM vs ESA mapping and for MoF to provide maps showing ESA-regen areas noted under "Summary of Information and Research Needs," page 75. Otherwise, no immediate opportunity is apparent. | (c) No opportunity. |
| ST 1 | (x2) _______ ha's of forests currently classified as inoperable (not a silviculture strategy). | (x) The Arrow IFPA is assessing the potential for harvesting outside of the area currently defined as operable. See the IFPA *Forestry Plan*.<br>An outcome of moving the operability line higher might be greater difficulty achieving regeneration success. The need to investigate these regeneration implications is noted under "Summary of Information and Research Needs," page 75. | (x) See IFPA forestry plan. |

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[4] (Increase) means oriented to increasing harvest levels above those indicated by the TSR2 base case. (Maintain) means oriented to maintaining the harvest level indicated by the TSR 2 base case.

* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ST 2 | 2. Late rotation fertilize ____ ha/yr of suitable stands scheduled for harvest in the $2^{nd}$ decade to increase their volumes. (increase) | 2. A few years ago the district field-assessed about 45 000 ha for potential commercial thinning. The large majority of these areas were found to have small crowns and high densities. Consequently, CT was not recommended because of the concerns about the long delay in the crown recovery of the residual trees. The same findings would apply to late rotation fertilization potential – the majority of stands would not be suitable because of high densities and small crowns. The need to evaluate the late rotation fertilization potential of smaller live crown trees noted under "Summary of Information and Research Needs," page 76.<br>If 2 000 ha planned for $2^{nd}$ decade harvest could be identified that was also suitable for late rotation fertilization, this would indicate a potential fertilization program of 200 ha/yr. Increasing this to **400 ha/yr** would support the strategic objective of increasing overall timber supply availability/flexibility because:<br>• identifying stands that will be harvested for certain 10-20 years from now is difficult,<br>• areas that are not harvested on queue, could be given a second fertilization treatment to further enhance growth;<br>• this strategy is linked to MT1 (continuation of late rotation fert into the mid term), and fertilizing a greater area now also increases mid term timber supply.<br>Fertilizing 200 ha/yr would increase stand yields 15 m3/ha = 3 000 m3/yr starting in the $2^{nd}$ decade, approx = 0.5% of current AAC. If 400 ha/yr were fertilized, the benefit from the additional 200 ha/yr could either be harvested or accumulated in the timber supply to increase flexibility. | 2. Possible 3 000 m3/yr, beginning in $2^{nd}$ decade. |
| ST 3 | 3. Utilize large patch ~~cuts~~ sizes to emulate stand replacing fires (also overcomes adjacency?) (increase) | 3. Large patch sizes are becoming more common practice in order to emulate stand replacing fire events. This has no associated silviculture activity potential. It is noted here more for its potential to have a positive effect in overcoming adjacency constraints. This may reduce the need to use silviculture for the same purpose. Additional modelling required. Noted under "Summary of Information and Research Needs," page 76. | 3. Not a silviculture strategy but may affect silv strategy choices. Further info required. |
| ST 4 | 4. Achieve green-up earlier in existing managed stands currently aged 1-20 years in the watershed (9m green-up) and VQO zones (6-7 m green-up) by (increase – this is a subset of MT5): | | |
| ST 4 | (a) brushing ____ ha/yr for growth enhancement (in addition to ___ ha/yr to ensure free growing; and | (a) No opportunity. See MT 5(f1). | (a) No opportunity. See MT 5(f1). |

* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ST 4 | (b) spacing ____ ha/yr of pine stands (priority - those subject to repression);<br>(c) spacing ____ ha/yr of Douglas-fir stands (priority – those subject to seasonal moisture deficits); and | (b) (c). Current spacing program is about 150 ha/yr. Spacing may have a height effect on stands having seasonal moisture deficits but otherwise has no effect on green-up heights. It may have a temporary slight negative effect on VQO and H2O green-up by reducing crown closure.<br>Assume ½ of fertilizable area (see ST4 (d) below) will require early spacing to set up for fert program = **program of 150 ha/yr**. | (b) (c) No direct opportunity. Required for fertilization treatments. |
|  | (d) improving site index estimates* | (d) This item added during the workshop. See MT 5 (b2) for S.I. analysis. Higher site indices are estimated to reduce time to green up as follows:<br>2m 7m 9m 18mS/22mPl<br>S 1.5 4 5 9<br>Pl 2 6 9 46 | (d) 4-6 yr reduction in time to 7 m green-up. |
| ST 4 | (e) fertilizing suitable stands* | (e) This item added during the workshop. Target stands are in VQO areas outside of watersheds, 1-20 yrs old. Estimate between 3 000 to 5 000 ha of target stands. **Potential fertilization program of 300 ha/yr** (equal to about 20% of annual area harvested. These are the main areas to be harvested and therefore should be the focus of intensive management efforts (i.e., from improved seed on up). To be of greatest value, this fert would be applied at an earlier age than would be normal under a multiple fert regime.<br>No info available in the workshop on reduction in time until green-up. Post-workshop review indicates about a 20% height response 3 years following Pl fertilization (Brockley, 1989). Therefore, a rough estimate of green-up gain of 1 yr every five years. If fertilization takes place at around age 15, should be about a 2 yr reduction in time to 7 m green-up. | (e) 2 yr reduction in green-up age. |
| ST 4 | Summary | 4. Summary. Workshop estimate was the above could in theory drop VQO green-up by as much as 10 years, from 28 yrs (7 m) to 18 yrs. Post-workshop analysis indicates a 6-8 year reduction to about the 20 year range is more likely. The largest component of this would be from revised site productivity estimates which would be applicable across the entire THLB. The IFPA analysis indicates a 5 yr across-the-board reduction in green-up ages extends the initial harvest level from 1 decade to 2. Alternatively, a 5 yr reduction in green-up ages substantially improves availability in the critical 3rd and 9th decades. The effects of a targeted fertilization program requires modelling to determine. | 4. Summary.<br>Substantially improved timber availability in the 3rd and 9th decades. |

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* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | | Anticipated Result |
|---|---|---|---|---|
| | **Short Term Harvest Forecast Summary** | Potential Strategy # | Effect | |
| | | **ST1** Recover merch volumes from: | | |
| | | (a) deciduous stands | No opportunity | |
| | | (b) non-merch conifer stands | Further info required | |
| | | (x) ESA's | No opportunity | |
| | | (x) inoperable areas | Pursued under IFPA | |
| | | **ST2** Late rotation fertilization 400 ha/yr | 3 000 m3/ha starting in $2^{nd}$ decade | |
| | | **ST3** Utilize large patch sizes | Not a silv. strategy. Further info req'd | |
| | | **ST4** Earlier green-up | | |
| | | (a) brushing for growth | No opportunity | |
| | | (b-c) space 150 ha/yr | No direct opportunity, 150 ha/yr req'd to set up stands for fertilization | |
| | | (d) improved SI estimates | 4-6 yr reduction in 7 m green-up across entire THLB | |
| | | (e) fert 1-20 yr old stands in VQO o/s W/S | (300 ha/yr) 2 yr reduction in 7 m g-up in treated stands. Requires modelling. | |
| | | ST 4 Summary | 6-8 yr reduction in green-up ages in some stands - improves timber availability. | |
| | **Conclusion** | Opportunities were identified that will improve overall timber availability. The short term harvest forecast can be expected to be similar to the IFPA forecast. Increased availability improves the likelihood that this forecast is attainable. | | |

### *8.2.3 Mid Term (21 - 80 years)*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| MT 1 | 1. Late rotation fertilize ____ ha/yr of existing stands scheduled for harvest 20 | 1. This strategy is a continuation of ST 2. See ST2 | 1. Possible 3 000 m3/yr. |

* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
|  | to 90 years from now to increase their volumes (continuation of ST 2). (increase) |  |  |
| MT 2 | 2. Repeat fertilize stands presently 21 – 60 years old to increase their volumes at harvest. (increase) | 2. This strategy is focused on those stands that will be harvested during the shortfall period. Few of these stands are suitable for fertilization. The origin of 40-60 year old stands is intermediate utilization logging in the 1940's through 1960's or fire. These stands have poor structure. Stands aged 21-40 have not had stocking control and are generally too dense for fertilization. | 2. No opportunity. |
| MT 3 | 3. Reduce the minimum harvest ages of stands presently 1 – 20 years old by: (increase) | 3. The difference between this potential strategy and ST4 is that ST4 focuses on green-up ages in VQO and H2O while this strategy focuses on minimum harvestable ages across all zones. Much of the analysis undertaken under MT 5 is applicable to this potential strategy.<br>Fdi and spruce stands aged 1-20 yrs will be considered managed stands in TSR2. All other species < 11 yrs in age will be considered managed. | 3. |
| MT 3 | (a) brushing ____ ha/yr for growth enhancement (in addition to ___ ha/yr to ensure free growing; | (a) The TSA does not have a major brush problem. | (a) No opportunity. |
| MT 3 | (b) spacing ____ ha/yr of pine stands (priority - those subject to repression); | (b) See MT 5 (g-h) | (b) Improves availability. See MT5 (g-h) |
| MT 3 | (c) spacing ____ ha/yr of Douglas-fir stands (prioity – those subject to seasonal moisture deficits); and | (c) See above. | (c) See above. |
| MT 3 | (d) repeat fertilizing ____ ha/yr. | (d) See MT5 (i) | (d) See MT5 (i). Improves availability. |
| MT 4 | 4. Investigate stocking levels of stands of Fdi and spruce*, 21-30 yrs of age and of all other species 11-30 yrs of age. | 4. Potential strategy reworded to include spruce with Fdi. This is how it will be treated in TSR2.<br>The cut-off ages for managed stands are lower than in most other management units. The designation of "other" species under 11 yrs of age as managed stands is particularly low. Stands that are in the age classes immediately above these are assigned VDYP yields which are much lower than TIPSY yields. Because the primary difference between the two model yields is well-spaced stocking, stocking surveys of the stands in the ages immediately above those considered to be managed may indicate that they are better estimated as TIPSY yields, perhaps with a higher OAF1 factor. The need for surveys is noted under "Summary of Information and Research Needs," page 76. | 4. Surveys required. Has potential to increase the yield estimates of the target stands by 20% to 30%. |

* *Indicates a potential strategy that was added during the workshop.*

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td>MT 5</td><td>5. Reduce green-up ages of about-to-be-regenerated stands by 8 years in the VQO (base case - 28 yrs to 7 m ht) zone and by 10 years in the watershed zones (base case - 34 yrs to 9 m ht) by: (increase)</td><td>5. See MT5 "Summary" below.</td><td>5. See MT5 "Summary" below.</td></tr>
<tr><td>MT 5</td><td>(a) site preparing ___ additional hectares;</td><td>(a) About 400 ha of 1400 ha planted annually is currently site prepped. 100 ha is mech site prep and 300 is prescribed burned. Requirements for coarse woody debris, smoke control and site/soils sensitivities prevent increasing the area of site prep. No additional opportunity. Concern expressed that the large reduction in site prep over the last two decades may be reducing site/stand productivity. The need to evaluate this is noted under "Summary of Information and Research Needs," page 76.</td><td>(a) No opportunity.</td></tr>
<tr><td>MT 5</td><td>(b1) using improved seed;</td><td>(b1) All even-aged managed areas are planted (1 400 ha/yr). In 1998 about 23% of all planted area was improved S but the volume gain is low, estimated between 2 – 3%. Some participants felt the actual gain will be greater, given the visibly better growth seen in the field. Future tree improvement gains by 2007 are estimated to be:
<table>
<tr><th>%</th><th></th><th>% vol gain (stand level)</th><th></th><th>% gain</th><th>seed (million/yr)</th><th></th></tr>
<tr><th>THLB</th><th>Species</th><th>Now</th><th>2007</th><th>(TSA level)</th><th>need</th><th>production</th></tr>
<tr><td>30</td><td>Sx</td><td>2 - 3</td><td>14</td><td>4</td><td>0.6</td><td>7.0</td></tr>
<tr><td>20</td><td>Pl</td><td>2 - 3</td><td>12</td><td>2</td><td>0.4</td><td>5.6</td></tr>
<tr><td>30</td><td>Fdi</td><td>-</td><td>0.3</td><td>0</td><td>0.6</td><td>0.5</td></tr>
<tr><td>20</td><td>Lw</td><td>-</td><td>7</td><td>1</td><td>0.4</td><td>0.9</td></tr>
<tr><td>5</td><td>Pw</td><td>-</td><td>0</td><td>0</td><td>-</td><td>-</td></tr>
<tr><td></td><td></td><td></td><td></td><td>7</td><td></td><td></td></tr>
</table>
Fdi and Lw are forecast to offer relatively little volume gain. Other than for Fdi, there should be adequate improved seed available to meet the needs for the TSA.<br>
About 90% of harvested areas are planted, so the LTHL gain across the entire TSA = .9 X .07 ≅ 6%.<br>
There is substantial variation over the above estimates. For example, some spruce orchards are exhibiting 25% gains. The best of the improved seed for each species should be targeted to areas needing quick green-up. Unfortunately VQO areas are Fd/Pl/Lw/Pw sites for which there isn't large-gain improved seed available. A seed planning and use co-operative is proposed for the TSA licensees to lobby for more and better improved seed and to co-ordinate the use of the best available seed to greatest strategic advantage. Noted under "Summary of Information and Research Needs," page 76. A strategic target of 20% yield gain at the TSA level was adopted.<br>
Tree improvement could reduce green-up (estimate by 3 yrs on 7 m green-up ht) & minimum harvest ages (estimate by 10 yrs) on 50% of the THLB. Green-up is not an is-</td><td>(b1)
<table>
<tr><th>stand level</th><th></th></tr>
<tr><td>Vol gain –</td><td>up to 25%</td></tr>
<tr><td>GU red'n (7m)–</td><td>1 yrs</td></tr>
<tr><td>min age red'n -</td><td>10 yrs</td></tr>
</table>
<table>
<tr><th>TSA level</th><th></th></tr>
<tr><td>Vol gain –</td><td>6%</td></tr>
<tr><td>GU red'n (7m)–</td><td>0.5 yr</td></tr>
<tr><td>min age red'n -</td><td>5 yrs</td></tr>
</table>
See "Summary" below.</td></tr>
</table>

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* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
|  |  | sue in partial-harvesting areas. |  |

Time to green-up reduction was calculated in the workshop as follows. An SI of 18 (avg for S from Martin, 1999) means a spruce stand would hit 18 m at breast height age 50. If the 14% volume gain associated with improved S seed is considered to largely equate to faster ht growth, it takes 14% less time, or (.14 X 50 =) 7 yrs, to get to 18 m. On a strictly pro-rata basis, which is not technically correct because total age at ht 18 is > 50 (adding in regen delay and time to reach breast ht), reduced time until green-up is as shown in the table below. (top line is workshop analysis, lower lines are post-workshop TIPSY analysis for Spruce, SI 18 and Pl, SI 22).

Post workshop analysis indicates workshop green-up age reduction assumptions were erroneous. Post-workshop results are used in "expected results". (min age reduction assumptions not checked.)

| green-up ht (m) | 2 | 7 | 9 | 18S/22Pl |
|---|---|---|---|---|
| Age reductions |  |  |  |  |
| Workshop calc'n | -1 | -3 | -4 | -7 |
| TIPSY analysis - spruce |  |  |  |  |
| (time SI 18) | 13.5 | 28 | 33 | 59 |
| (time SI 18.8) | 13 | 27 | 32 | 56 |
| (difference) | -.5 | -1 | -1 | -3 |
| TIPSY analysis – Pl |  |  |  |  |
| (time SI 22) | 10 | 20 | 23 | 58 |
| (time SI 23) | 10 | 19 | 22 | 54 |
| (difference) | 0 | -1 | -1 | -4 |

TIPSY based on following logic:

Spruce, SI 18 hits 18 m at age 59. Vol at this age is 156 m3/ha (17.5 cm util., 1400 sph). A 14% volume gain (TI volume gain is measured at age 12 and forecast to age 60, so ages are comparable) on this vol gives a total vol of 178 m3/ha. To get 178 m3 at age 59 requires an SI of approx 18.8. Ages at the various green-up hts are then looked up in TIPSY at this SI and compared to ages for those heights at SI 18.

Pl, SI 22 hits 22 m at age 59. Vol at this age is 288 m3/ha (12.5 cm util. 1400 sph). A 12% volume gain on this vol gives a total vol of 323 m3/ha. To get 323 m3 at age 59 requires an SI of approx 23. Ages at the various green-up hts are then looked up in TIPSY at this SI and compared to ages for those heights at SI 22.

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* *Indicates a potential strategy that was added during the workshop.*

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td></td><td>(b2) site index shift;*</td><td>(b2) This potential strategy was added during the workshop. The volume implications of a possible site index shift were calculated in the workshop as follows:
<table>
<tr><th>%</th><th></th><th></th><th></th><th></th><th>vol % gain</th><th></th></tr>
<tr><th>THLB</th><th>Species</th><th>Current SI</th><th>Martin SI</th><th>(SI % gain)</th><th>stand</th><th>TSA</th></tr>
<tr><td>30</td><td>Sx</td><td>16</td><td>18</td><td>15</td><td>20</td><td>6</td></tr>
<tr><td>20</td><td>Pl</td><td>16</td><td>22</td><td>40</td><td>50</td><td>10</td></tr>
<tr><td>30</td><td>Fdi</td><td>20</td><td>24</td><td>20</td><td>35</td><td>11</td></tr>
<tr><td>20</td><td>Lw</td><td>20</td><td>24</td><td>20</td><td>35</td><td>7</td></tr>
<tr><td>5</td><td>Pw</td><td>-</td><td>24</td><td>-</td><td>-</td><td>34</td></tr>
</table>
The Martin (1999) SI gains are in the range of the possible 10-30% gains suggested by an IFPA estimate prepared by J.S. Thrower. A rough guide used in the workshop was every 1m SI increase results in a 10% yield increase. This shift is expected to apply to the entire THLB. The Arrow IFPA has funded a $300,000 project over the next 2 yrs to improve SI estimates.<br><br>The table below shows the results of a post-workshop TIPSY analysis of the possible effects of a site index shift on green-up ages. For spruce, an anticipated 2m SI shift results in a potential 4 yr reduction for 7m green-up while for Pl an anticipated 6 m shift yields a 6 yr reduction.
<table>
<tr><th>green-up ht (m)</th><th>2</th><th>7</th><th>9</th><th>18S/22Pl</th></tr>
<tr><td>Age reductions</td><td></td><td></td><td></td><td></td></tr>
<tr><td>TIPSY analysis - spruce</td><td></td><td></td><td></td><td></td></tr>
<tr><td>(age SI 16)</td><td>15</td><td>32</td><td>38</td><td>68</td></tr>
<tr><td>(age SI 18)</td><td>13.5</td><td>28</td><td>33</td><td>59</td></tr>
<tr><td>(difference)</td><td>-1.5</td><td>-4</td><td>-5</td><td>-9</td></tr>
<tr><td>TIPSY analysis – Pl</td><td></td><td></td><td></td><td></td></tr>
<tr><td>(age SI 16)</td><td>12</td><td>26</td><td>32</td><td>104</td></tr>
<tr><td>(age SI 22)</td><td>10</td><td>20</td><td>23</td><td>58</td></tr>
<tr><td>(difference)</td><td>-2</td><td>-6</td><td>-9</td><td>-46</td></tr>
</table></td><td>(b2)
<table>
<tr><th colspan="2">stand level</th></tr>
<tr><td>Vol gain –</td><td>up to 50%</td></tr>
<tr><td>GU red'n (7m)–</td><td>6 yrs</td></tr>
<tr><td>min age red'n -</td><td>yrs</td></tr>
<tr><th colspan="2">TSA level</th></tr>
<tr><td>Vol gain –</td><td>34%</td></tr>
<tr><td>GU red'n (7m)–</td><td>5 yr</td></tr>
<tr><td>min age red'n -</td><td>yrs</td></tr>
</table>
See "Summary" below.</td></tr>
<tr><td>MT 5</td><td>(b3) reduce regeneration delay;*</td><td>(b3) This potential strategy was added during the workshop. The IFPA analysis used a 2 year regen delay for all species. MLSIS indicates all areas are currently planted within an average of 1.7 years of harvest commencement. Allowing for some failures, this performance would be difficult to improve upon.</td><td>(b3) Current practice 1.7 yrs. No add'l opportunity.</td></tr>
<tr><td>MT 5</td><td>(c) using larger planting stock</td><td>(c) Current practice is to plant 410 and 415 stock types, which cost about $0.25/seedling. Fd/Lw stock is 25-40 cm tall, Pl 15 cm, and improved Sw 35 cm. Larger stock would be much more costly and is not considered practical.</td><td>(c) Current practice. No add'l opportunity.</td></tr>
</table>

* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| MT 5 | (d) planting white pine wherever suitable; | (d) Pw would achieve 7 m green-up ht faster than Fdi or Lw. Estimate Fd/Lw 7 m green-up to be 20 yrs at SI 24 (post-workshop TIPSY indicates 18 yrs). Only want to plant rust resistant stock. The need to investigate access to improved Pw seed and green-up potential (contact Pope and Talbot re TFL 23 Pw experience) noted under "Summary of Information and Research Needs," page 76. | (d) Further info required. |
| MT 5 | (e) fertilizing at time of planting | (e) Results are inconclusive. Need for further research noted under "Summary of Information and Research Needs," page 76. A 1 yr reduction in 7 m green-up was felt possible. It's also possible that if the fertilizer gives an initial ht growth increase there would have to be a later period of lower ht increases while the tree concentrates on root growth to balance root/stem mass.<br>Tea bag cost is about 9¢ + 2¢ for placement = 11¢ X 1 400 sph = $154/ha. **Opportunity area of 300 ha/yr**, the area expected to be harvested in VQO and watershed zones. | (e) Limited opportunity. 1yr reduction for 7 m green-up assumed in VQO and H2O zones. Further info required. |
| MT 5 | (f1) brushing ____ ha/yr for growth enhancement (in addition to ___ ha/yr to ensure free growing) | (f1) Brushing for growth can reduce brush impedance as well as increase survival/site occupancy. About 250 ha/yr out of 1 400 ha/yr of plantations require brushing for survival. About 40% of these sites require a 2$^{nd}$ brushing (100 ha/yr). Total annual brushing program is therefore 350 ha/yr. Beyond these sites, there are few other areas that would benefit from brushing treatments.<br>Experimental trials indicate brushing may serve to reduce ht growth in favour of heavier stem growth. This is because the presence of brush forces the tree into ht growth to get above the brush.<br>Local FG standards are 1 200 sph target and 700 sph minimum. Actual stocking at FG on these sites is about 1 000 sph. More information/assessment of the yield implications of low end stocking is needed. Noted under "Summary of Information and Research Needs," page 76. | (f1) No opportunity. Further information required. |
| MT 5 | (f2) reduce stand voids | (f2) TIPSY OAF1 of 15% used in the IFPA analysis. The fact that only 27% of the TSA falls within the THLB indicates more rugged terrain and would suggest that 15% is appropriate. An OAF survey technique which can be done in conjunction with regen surveys is now available to help improve OAF estimates. Would have to be a statistically valid sample in order for info to be accepted for TSR process. Data could build up over time in conjunction with regen surveys and at some point remaining data gaps could be filled in with a focussed survey program. **A retrospective OAF1 survey program of areas harvested over the past 20 years is proposed**. Need to investigate use of OAF surveys noted under "Summary of Information and Research Needs," page 76. | (f2) No opportunity. Surveys required. |

* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| MT 5 | (g) spacing ____ ha/yr of pine stands (priority - those subject to repression);<br>(h) spacing ____ ha/yr of Douglas-fir stands (priority – those subject to seasonal moisture deficits); and | (g-h) No Pl repression problem in the TSA. Season moisture deficits were not discussed.<br>The min age criteria used in the IFPA analysis was 25cm avg. DBH or 150 m3/ha stand vol. The DBH criterion is high compared to the other TSA's in the region and resulted in very high min ages for poor sites (see Figure 6, page 21). Because it is likely that the model selected poor sites to satisfy older forest requirements, this may result in an over-estimate of LTHL if older forests over a range of site productivity are in fact desired.<br>Spacing can be used to achieve min harvestable stem sizes earlier. TIPSY indicates spacing Pl stands from 3 000 sph down to 1 600 sph can reduce time to 22.5 cm stand avg DBH by 14 yrs and by 25 yrs if spaced to 1 200 sph (see Table 1, page 63). TIPSY indicates the MAI of the spaced stand to be slightly higher than that of the unspaced stand when spaced to 1 600 sph and about 9% lower when spaced to 1 200. Greater min age reductions are obtained for Fdi and spruce when spaced from 3 000 sph to 1 200 sph (24 yrs and 41 yrs respectively at 17.5 cm DBH util.), again with no loss in MAI.<br>Spacing can have a role in filling the age class gap, however the stands in the age classes immediately following the gap are not themselves in great abundance and therefore limit the opportunity to lower their minimum ages to bring volumes forward to help fill the mid term shortfall. (see Figure 5, on page 20). The IFPA analysis (see Figure 6, page 21) indicates a 10 yr reduction in all minimum harvest ages has no effect on the harvest forecast. Spacing, therefore, is best looked upon as a means to improve overall timber availability and to improve stand quality (see also strategy Q1 – page 60). | (g-h)<br>stand level<br>Vol gain – 0%<br>GU red'n – 0 yrs<br>min age red'n - 14-41 yrs<br>TSA level<br>Vol gain – 0%<br>GU red'n – 0 yr<br>min age red'n - ___yrs<br>See "Summary" below. |
| MT 5 | (i) repeat fertilize _____ ha/yr on a 15 yr return cycle (increase). | (i) On a long term steady state basis, 50% of the species (Fdi & Pl) on 65% of the site classes could be suitable for a multiple fertilization regime (¼ G, all M & ¼ P site calculated on an adjusted SI basis of 30% of THLB being good, 55% M and 15% P). About 40% of this is considered available for treatment, the primary reason for unavailability being the large area in watersheds. More difficult access areas are already netted out on a species basis, with most inaccessible areas being spruce. This equates to (.50 X .65 X .4= ) 13% of the THLB. This could be reduced further to 10% to allow for possible fisheries concerns. (Fertilizer is added directly to the Arrow Lakes to improve nutrient levels for fisheries management purposes under the Fish and Wildlife Branch's Compensation Program. The need to check with F&W re fertilizer effects noted under "Summary of Information and Research Needs," page 76.) 10% of THLB ≅ 20 000 ha. On a 15 yr return cycle, **this requires a program of (20 000/15 = ) 1 250 ha/yr**. Estimated cost at $200/ha = $0.25 million/yr.<br>Probably 3 applications would be required, with the first occurring after juvenile spacing. Each application is estimated to add 15 m3/ha of growth, so 3 applications yields an additional 45 m3/ha. This is a 20% volume gain on a base stand yield of 250 m3/ha. A 20% volume gain across 10% of the THLB would increase long term harvest levels (0.2 X 0.1 =) 2%.<br>Guesstimate in the workshop that a repeat fert program giving a 20% stand level volume gain would alternatively enable at least a 15 yr stand level reduction in min ages. Post workshop TIPSY review indicates about a 10 yr gain for Pl SI 22, 1600 sph. If this were applicable across 10% of the THLB, would be a 1 yr min age reduction. See MT5 (g-h) | (i)<br>stand level<br>Vol gain – up to 20%<br>GU red'n – 0 yrs<br>min age red'n - 10 yrs<br>TSA level<br>Vol gain – 2%<br>GU red'n – 0 yr<br>min age red'n - 1 yr<br>See "Summary" below. |

* *Indicates a potential strategy that was added during the workshop.*

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td></td><td></td><td>for harvest forecast implications.</td><td></td></tr>
<tr><td>MT 5</td><td><b>SUMMARY</b></td><td>The following summarizes the estimated effects of strategy MT5. Effects at the TSA level are prorated based on the opportunity area as a percentage of the TSA's THLB. Totals are estimated using best judgement with respect to potential overlapping effects. The volume gain in the form of larger logs and the min age reductions cannot both be captured at the same time. (However, a volume gain in the form of a higher MAI and therefore a higher LTHL can occur at the same time as a min. age reduction.) Benefits must be allocated to one or the other based on TSA need.
<table>
<tr><th>Strategy</th><th colspan="2">Volume Gain (%)</th><th colspan="2">Green-up age red'n(yrs)</th><th colspan="2">Min Harv. Age red'n(yrs)</th></tr>
<tr><th></th><th>Stand</th><th>TSA</th><th>Stand</th><th>TSA</th><th>Stand</th><th>TSA</th></tr>
<tr><td>(a) incr. site prep</td><td colspan="6">no opportunity</td></tr>
<tr><td>(b1) improved seed</td><td>25</td><td>6</td><td>1</td><td>0.5</td><td>10</td><td>5</td></tr>
<tr><td>(b2) site index</td><td>up to 50</td><td>34</td><td>6</td><td>5</td><td colspan="2">not assessed</td></tr>
<tr><td>(b3) regen delay</td><td colspan="6">current practice – no add'l opportunity</td></tr>
<tr><td>(c) large stock</td><td colspan="6">current practice – no add'l opportunity</td></tr>
<tr><td>(d) plant Pw</td><td colspan="6">potential opportunity - further info required</td></tr>
<tr><td>(e) fert at planting</td><td>-</td><td>-</td><td>1</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td>(f1) brush for growth</td><td colspan="6">no opportunity</td></tr>
<tr><td>(f2) reduce voids</td><td colspan="6">no opportunity – further info required</td></tr>
<tr><td>(g) (h) spacing</td><td>0</td><td>0</td><td>0</td><td>0</td><td>14-41</td><td>no calc</td></tr>
<tr><td>(i) repeat fert</td><td>20</td><td>2</td><td>0</td><td>0</td><td>10</td><td>1</td></tr>
<tr><td>Total</td><td>60?</td><td>40?</td><td>8</td><td>6.5</td><td>35+?</td><td>20?</td></tr>
</table>
Conclusion: the objective of reducing green-up ages by 8 yrs (VQO) and 10 yrs (watershed) is marginally attainable, depending largely on the outcome of site index estimation studies.</td><td>5. Summary<br>Significant improvement in timber availability (see Figure 10, page 23).</td></tr>
<tr><td>MT 6</td><td>6. Set up stands presently 60 – 100 years old for future partial harvesting/ commercial thinning in the VQO and watershed zones by:<br>(a) commercial thinning to recover small diameter products; and<br>(b) repeat fertilizing ____ ha/yr.</td><td>6. Stands presently 60 – 100 years old will be 110 – 150 years old 50 years from now. Figure 5, page 20, illustrates that there will be many stands in this age group at that time. Those that are unavailable for harvest will be candidates for commercial thinning or partial harvesting. This potential strategy is about using silviculture now to prepare such stands for either treatment. Workshop participants felt very few stands presently 60 – 100 years old present such opportunities. While some stands will be amenable to partial harvesting, very few are suitable for fertilization to prepare them for either partial harvesting or commercial thinning. The fertilization problem is again a matter of stand density and small live crowns which is discussed under ST2.</td><td>6. No opportunity.</td></tr>
<tr><td>MT 7</td><td>7. Increase the area satisfying older forest biodiversity requirements in decades 8-13 by achiev-</td><td>7. At this time, it is probable but not certain that old growth requirements will be constraining mid term harvest levels. Spacing and fertilizing younger existing stands will aid in the recruitment of stands having older forest attributes at earlier ages. No additional opportunities were identified beyond those under MT3/MT5. Some MT3 stands may have to be</td><td>7. Await results of IFPA studies.</td></tr>
</table>

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* *Indicates a potential strategy that was added during the workshop.*

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td></td><td>ing the desired stand characteristics by 100 years of age by:<br>(a)spacing ____ ha/yr; and<br>(b)repeat fertilizing ____ ha/yr.</td><td>reserved for older forest purposes. Presume that if these stands are not available for this purpose, harvest levels would be at risk of further reduction to accommodate older forest biodiversity needs.<br>The IFPA is funding studies to help determine the desired structural characteristics of older forests. Once these studies are complete, silviculture can potentially then be used to help achieve the desired characteristics.</td><td></td></tr>
<tr><td></td><td><b>Mid Term Harvest Forecast Summary</b></td><td>
<table>
<tr><th>Potential Strategy #</th><th>Effect</th></tr>
<tr><td><b>MT1</b> Late rotation fert.</td><td>3 000 m3/ha. Improves availability</td></tr>
<tr><td><b>MT2</b> Repeat fert stands 21-60 yrs old</td><td>No opportunity</td></tr>
<tr><td><b>MT3</b> Reduce min ages of stands 1-20 yrs old by:</td><td></td></tr>
<tr><td>(a) brushing for growth</td><td>No opportunity</td></tr>
<tr><td>(b)(c) spacing</td><td>Improves availability. Sets up stands for fertilization.</td></tr>
<tr><td>(d) repeat fertilizing</td><td>Improves availability.</td></tr>
<tr><td><b>MT4</b> Investigate stocking levels</td><td>Surveys required. 20-30% potential gain in age classes 2 & 3</td></tr>
<tr><td><b>MT5</b> Achieve 8-10 yr earlier green-up</td><td>Significant improvement in availability. Potential for 30-40% volume gain. See MT5 summary.</td></tr>
<tr><td><b>MT6</b> Prep 60-100 yr old stands for PH/CT</td><td>No opportunity.</td></tr>
<tr><td><b>MT7</b> Increase area in older forests</td><td>Await results of IFPA studies.</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td><b>Conclusion</b></td><td>The mid-term shortfall is likely to remain at about the IFPA forecast level. There are, however, significant opportunities to increase timber supply availability.</td><td></td></tr>
</table>

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* *Indicates a potential strategy that was added during the workshop.*

### 8.2.4 *Long Term (81+ years)*

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td>LT 1</td><td>1. Maintain the THLB by<br>(a) Planting ____ ha of backlog NSR; and<br>(b) Maintaining ____ ha of existing backlog plantations.</td><td>1. As of June, 1999 there are 1 813 ha of backlog NSR in the ISIS database. Approximately 565 hectares of this is inaccessible or uneconomic to treat. Of the remainder, 1/3 is assumed untreatable, 1/3 is assumed stocked and 1/3, or about 400 ha, is assumed to be treatable. It appears there is about 1 000 ha that are included in the IFPA base case that have since been determined or assumed to be untreatable. Base case LTHL may therefore be overstated by about 0.5%.<br>(a) Most of the backlog NSR has been treated or reclassified. The 400 remaining treatable ha requires **a program of fill-planting 100 ha/yr for the next 4 years** to achieve free growing.<br>There is the possibility that areas currently classed as SR may fall back into NSR. **A survey program of 2 000 ha/yr is needed** to monitor regeneration on areas harvested pre-1987.<br>(b) About 50% of recently planted backlog area will require brushing (total 200 ha, but firm estimate not available).
<table>
<tr><th></th><th colspan="4">Area (ha)</th></tr>
<tr><th></th><th></th><th colspan="3">Brush</th></tr>
<tr><th>Year</th><th>Plant NSR</th><th>New Plnt'n</th><th>Existing</th><th>Total</th></tr>
<tr><td>1</td><td>100</td><td></td><td>50</td><td>50</td></tr>
<tr><td>2</td><td>100</td><td></td><td>50</td><td>50</td></tr>
<tr><td>3</td><td>100</td><td></td><td>50</td><td>50</td></tr>
<tr><td>4</td><td>100</td><td></td><td>50</td><td>50</td></tr>
<tr><td>5</td><td></td><td></td><td></td><td>0</td></tr>
<tr><td>6-10</td><td></td><td></td><td></td><td>0</td></tr>
</table></td><td>1. (a) (b) Base case potentially overstated by 0.5%.</td></tr>
<tr><td>LT 2</td><td>2. Increase the THLB by:</td><td>2. Following are IFPA/TSR2 netdown figures. Net THLB ≅ 201 500 ha
<table>
<tr><th></th><th>Area (ha)</th><th>%THLB</th></tr>
<tr><td>(a)Decid</td><td>8 300</td><td>4.0</td></tr>
<tr><td>(b)Non-merch</td><td>3 100</td><td>2.1</td></tr>
<tr><td>(c)Low site</td><td>1 800</td><td>1.7</td></tr>
</table></td><td></td></tr>
</table>

* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| LT 2 | (a) converting /rehabilitating 100 ha/yr of deciduous stands; (increase) | (a) MoELP considers these areas as valuable towards meeting biodiversity objectives and would object to them being changed to coniferous species. General consensus (MoELP rep absent at the time) was to consider ¼ of these sites (about 2 000 ha) as eligible for conversion to coniferous species. This equals about 1% of the THLB. **A program of 100 ha/yr over 20 years is required**. See also ST1. | (a) 1% LTHL gain. |
| LT 2 | (b) converting/rehabilitating non-merchantable stands; (increase) | (b) See ST1. | (b) Possible opportunity. Further info required. |
| LT 2 | (c) assessing _______ ha of low-site stands for proper classification; or | (c) Workshop participants were unfamiliar with the location and actual condition of these sites. MoF will produce a thematic map highlighting these areas for review by participants. Noted under "Summary of Information and Research Needs," page 76. | (c) Further info required. |
| LT 2 | (d) improve the site productivity of low-site stands by (fertilization?). (increase/maintain) | (d) Needs to await results of LT 2 (c). | (d) Not applicable. |
| LT 2 | (e)rehabilitating 500 ha fume kill area. | (e) There are substantial areas of fume kill around the trail smelter. Much of this is private land. Crown areas are mostly classed as NC Brush. The Arrow IFPA has already identified the potential for rehabilitation and proposes a 2 year **test of 100 ha/yr** of rehabilitation to be evaluated for further potential once completed. Assume will continue at the rate of 100 ha/yr for 5 yrs. | (e) 0.25% LTHL gain. |
| LT 2 | (f) recovering area in permanent access structures. | (f) The IFPA netdown process removed 3 900 ha and 11 900 ha of existing and future roads respectively. General factors were 3% reduction of THLB for roads, 3% for trails and 2.4% for landings. This occurs over a 40 year period. A rehabilitation program of 150 ha/yr would recover half of the area deducted for future roads, or 6 000 ha in total. This would increase the THLB by 3%. | (f) 3% LTHL increase. |
| LT3 | 3. Increase regenerated stand volumes by, in addition to those practices in MT 5:<br>(a)managing stocking so voids do not account for more than 10% of the area (increase); and<br>(b)repeat fertilize _____ ha/yr on a 15 yr return cycle (increase). | 3. These subjects were covered together with the related activities under MT 5. See MT 5. | 3. See MT 5. Potential total volume gains of about 40%, largely due to improved site index estimates and tree improvement. |

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* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| LT 4 | 4. Reduce losses to root rot by: (increase)<br>(a) pushover logging / stumping _____ ha/yr;<br>(b) planting alternate species on ______ ha/yr;<br>(c) pop-up spacing on _____ ha/yr; or<br>(d) small diameter spacing. | 4. IFPA analysis used standard TIPSY OAF2 factor of 5%. OAF2 can be broken down to 3% decay and 2% waste/breakage.<br>Workshop estimate of losses to root rot made as follows. Root rot affects 60% of the THLB. Of this, 20% is serious infection so (.6 X .2 = ) 12% of THLB is seriously infected. If the volume loss of the seriously infected stands is 20% then total volume loss at the TSA level associated with serious infection is (.12 X .2 =) 2.4%. This 2.4% is within the 3% decay allowance of a 5% TIPSY OAF2. If the TIPSY OAF2 decay allowance was considered to cover endemic/less serious losses, then an OAF2 of (5 + 2.4 = ) 7.4% would be appropriate. Given the significant presence of root rot in the wet belt, a higher OAF2 would appear warranted. However, root rot also contributes to stand voids which are estimated through TIPSY OAF1, and it was unclear in the workshop as to how the two OAF factors interact.<br>Due to a lack of time in the workshop, the potential activities (a) to (d) were not individually reviewed. Participants noted basic silviculture prescriptions are oriented to minimizing root rot impacts but that treatment options are limited by steep terrain, rockiness, etc.<br>The need for further study of root rot management techniques and improved OAF2 estimates (investigate Invermere methodology) is noted under "Summary of Information and Research Needs," page 76. | 4. Basic silviculture obligation. Being actively pursued. OAF2 estimate requires verification. |
| LT 5 | Maintain healthy forests and reduce timber losses by reducing risk of: | | |
| | (a) mountain pine beetle attack; | (a) Workshop discussions did not identify a silvicultural opportunity related to mountain pine beetle management. The need to investigate effects of juvenile spacing on mountain pine beetle resistance noted under "Summary of Information and Research Needs," page 76. | (a) No opportunity. |
| | (b) spruce leader weevil attack; and | (b) Some spruce leader weevil damage is presently occurring. Has the potential of being a major problem in the future. Current preventative strategy is to plant mixed species. No other strategies proposed. | (b) No opportunity. |
| | (c) white pine blister rust. | (c) No silvicultural activities proposed. White pine is generally < 30% of stand composition. Some Pw pruning has been done in association with spacing. Natural white pine may also be pruned as part of a basic silviculture obligation when it is needed to meet free-growing obligations. See also "Opportunities to Improve Timber Quality," page 59. | (c) No opportunity. |

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* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| LT 6 | 6. Manage some old IU logged areas for multiple non-timber values. | 6. 20 –30 years ago, timber was harvested to intermediate utilization (IU) standards. Harvested areas were generally left for natural regeneration and consequently have poor residual stocking in brushy areas. About 3 000 ha of such areas are within riparian reserve and management zones. If these areas were rehabilitated, they could be managed for old-growth as well as riparian values. Moving old growth management areas into the riparian zone and managing for both values on the same area could be less restricting on timber harvests than if both values were managed for on separate areas.<br>Evaluating this potential requires the following process:<br>1. Map environmental net-down areas;<br>2. Overlay past harvesting;<br>3. Identify those areas of past harvesting that are no longer available for future harvesting (e.g., in riparian reserve zones) and that would be suited to managing for multiple values;<br>4. Identify those existing environmental net-down areas that could subsequently be released for timber harvesting under IRM management.<br>5. Through modelling analysis, determine the cost-benefit of rehabilitating past harvested areas and managing for multiple non-timber values (cost) vs increased timber availability gained elsewhere (benefit).<br>Some sites may meet the stand structural requirements as they are now. Others would likely require rehabilitation. Rehabilitation costs are estimated to be:<br>- site prep - $800/ha<br>- planting - $800/ha<br>- brushing - $800/ha. Up to 3 brushings may be required.<br>Overall cost may be between $2 400 (1 brushing )and $4 000 (3 brushings) per ha.<br>**Initially a small trial of 100 ha/yr could be undertaken**. The need for further evaluation of this potential strategy is noted under "Summary of Information and Research Needs," page 76. This can be done under an IFPA-funded UBC project looking at habitat and silviculture strategy linkages. |  |

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* *Indicates a potential strategy that was added during the workshop.*

| Number | Potential Strategy/Action | Discussion / Current Status | | Anticipated Result |
|---|---|---|---|---|
| | Long Term Harvest Forecast Summary | Potential Strategy # | Effect | |
| | | **LT1** Backlog NSR | Base case potentially overstated by 0.5%. | |
| | | **LT2** Increase the THLB | | |
| | | (a) convert 2 000 ha decid | 1% LTHL gain | |
| | | (b) rehab non-merch | further info required | |
| | | (c) assess L site classifications | further info required | |
| | | (d) fert L site stands | not applicable | |
| | | (e) rehab 500 ha fume kill | 0.25% LTHL gain | |
| | | (f) recover perm. access structures | 3% LTHL gain | |
| | | **LT3** Incr regenerated stand vol's | Potential 40% LTHL increase from better site index estimates & tree improvement. | |
| | | **LT4** Root rot | OAF2 estimate requires verification. Base case potentially overstated by 2 –3%. | |
| | | **LT5** Reduce timber losses to: | | |
| | | (a) mountain pine beetle | no opportunity | |
| | | (b) spruce leader weevil | no opportunity | |
| | | (c) white pine blister rust | no opportunity | |
| | | **LT6** Manage old IU areas | Modelling analysis required. | |
| | Conclusion | Small gains may offset small reductions. Largest variable is the potential 40% increase associated with site index and tree improvement. Because such gains are probable but the estimates are highly uncertain, an interim target of recovering LTHL to today's level is reasonable until such time as better information is available. | | |

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* *Indicates a potential strategy that was added during the workshop.*

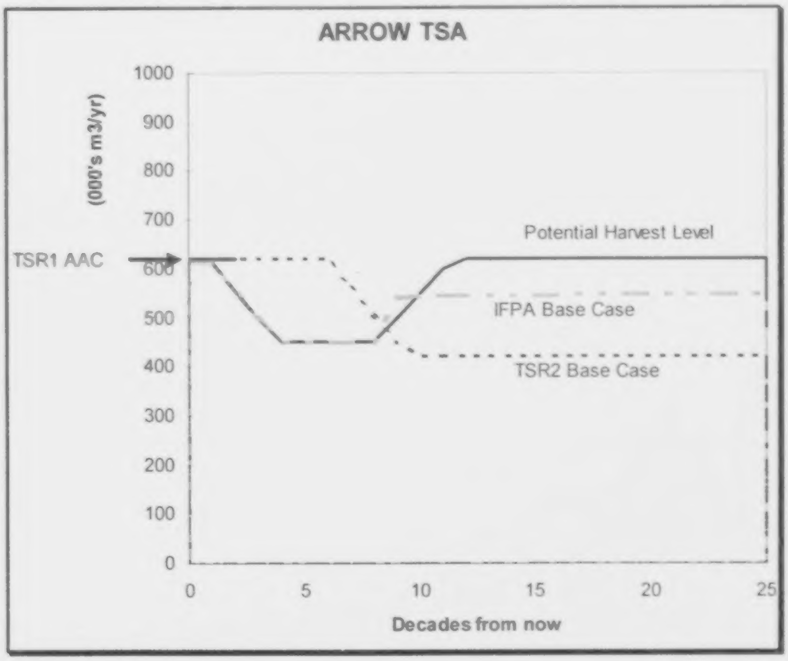
## 8.3 Potential Harvest Forecast

Workshop and post-workshop analyses indicate the following potential harvest forecast for each time period.

| | |
|---|---|
| Short Term | Opportunities were identified that will improve overall timber availability. The short term harvest forecast can be expected to be similar to the IFPA forecast. Increased availability improves the likelihood that this forecast is attainable. |
| Mid Term | The mid-term shortfall is likely to remain at about the IFPA forecast level. There are, however, significant opportunities to increase timber supply availability. |
| Long Term | Small gains may offset small reductions. Largest variable is the potential 40% increase associated with site index and tree improvement. Because such gains are probable but the estimates are highly uncertain, an interim target of recovering LTHL to today's level is reasonable until such time as better information is available. |

Figure 22 graphs the potential harvest level that may be attained through implementation of the silvicultural strategies in the preceding tables. This forecast is highly speculative and requires confirmation through computer-based modelling and analysis. It also includes silvicultural activities that are not within the traditional scope of incremental silviculture. Modelling may indicate more precise timing, targeting and program levels associated with incremental silviculture activities than could be developed in this interim strategy.

**Figure 22. Potential harvest forecast, Arrow TSA**



# 9. *Opportunities to Improve Timber Quality*

The effects of incremental silviculture on the future quality of the timber resource are not analyzed in the timber supply review or the IFPA analysis. Information in this section was gathered during the district workshop.

## 9.1 Product Objectives

The following are product objectives at the log level for the Arrow TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | | |
| Peelers | All | 35+ cm DBH, clear, 5 m log, min 20 cm top. |
| Building Log | Douglas-fir, larch, lodgepole pine, spruce | 42.5+ cm DBH, straight, low taper, minimal twist, min 9 m log, min 27.5 cm top |
| Poles | western redcedar | 27.5+ cm DBH, 13 m log, straight, min 10 cm top, no rot. |
| Large logs* | All | 42.5+ cm DBH, 5 m log |
| White pine* | western white pine | 22.5+ cm DBH, tight knots. |
| **Sawlog:*** | All except lodgepole pine | 27.5+ cm DBH. |
| | lodgepole pine | 22.5+ cm DBH. |

* Values are enhanced when "clear" of knots.

## 9.2 Potential Strategies by Response Time Frame

The following strategies have potential to increase timber quality. These were reviewed in the district workshop. The response time frame is the period in which the anticipated result is expected, not the period in which actions must necessarily commence.

| **Response Time Frame** | **Potential Strategy/Action** | **Discussion / Current Status** | **Anticipated Result / Premium Log Forecast** |
|---|---|---|---|
| Short Term (1 - 20 yrs) | None | Short term harvests will come from existing older stands which are not treatable to improve quality. | Quality profile of existing old growth will prevail. Assume this is equal to a recent coast-wide estimate of 15%. |
| Mid Term (21 - 80 yrs) | Q1. space ____ ha/yr to increase average stand DBHg$_{all}$ from ___ cm to ___ cm. | Current spacing program is 150 ha/yr, but this includes catch-up spacing on older stands and in fire areas. Normal regimes for naturally established stands are to space when density exceeds 3 000 sph and to leave unspaced where densities are below 3 000 sph. In the IFPA analysis, planted stands are established at 1 200 sph (workshop participants say they plant 1 400 sph) and assumed to not require spacing.<br>An analysis of large logs was prepared based on a district indication of a possible spacing program of 600 ha/yr. See "Large Premium Log Analysis," page 62, and Table 1 through Table 3 below.<br>Spacing overstocked stands is a pre-requisite to other stand management practices such as fertilization, pruning and commercial thinning.<br>There was inadequate time in the workshop to fully explore the implications of a spacing program on timber quality. No specific strategies for spacing for quality were proposed. Post-workshop, district staff indicated a strategy of spacing 400 ha/yr with a priority 4 ranking would be appropriate.[ | To be approximated from large log analysis. |
| | Q2. 1st lift prune ____ ha/yr to 3.5 m, and 2nd lift prune ___ ha to 5.5 m. | A clear log is defined as one capable of producing 25% clear lumber by volume. Based on this definition, other than from those forests managed to very old ages, harvests from 2nd growth stands in the later mid term and long term will produce no clear logs.<br>Max historic program has been 90 ha/yr. Currently ___ ha have been 1st lift pruned and only ____ ha's have been 2-lift pruned.<br>Goal is a 10 cm radius of clear wood. This requires a minimum DBH of 30 cm, preferably 35 cm. Target species are Pl, Fdi and Pw (future).<br>An annual pruning program of 200 ha/yr each lift (= 100 ha under 2-lift regime) would equal (100/1600 ha/yr harvested =) 6.25% of THLB. If 5 m = 25% of tree vol, (.0625 X .25 =) 1.5%/yr of future harvest volume will be clear logs resulting from pruning. To get 4.5% clear by volume would need to 2-lift prune roughly 300 ha/yr (600 ha/yr total). | 2¼ % clear log content across total annual harvest volume. |

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result / Premium Log Forecast |
|---|---|---|---|
| | | | |
| | Q3. Plant white pine species | White pine lumber commands a premium market price. Pending the outcome of further investigation of TFL 23 experience, increasing the planting of Pw stock could be considered as part of a quality objective. See MT5 (d) | See MT5 (d) |
| Long Term (81 + yrs) | As above. | As above. | As above. |

## 9.3 Large Premium Log Analysis

Three large log analyses are reported below. Each table shows at the right hand side a comparison of the effect of spacing 600 ha/yr vs not spacing any stands on the percentage by volume of the total future harvest that will be in large premium logs. This is equal to spacing just under 40% of the annual area harvested under an even-aged management system (1 400 ha/yr).

All tables were generated using TIPSY version 2.1e with standard OAF's, to a 12.5 cm utilization with Pl leading and to a 17.5 cm utilization with other species leading. Because TIPSY has no mechanism for in-growth following planting, unspaced stands were assumed to have 1 600 sph of ingrowth, and were modelled as 3 000 sph planted (1 400 sph planted + 1 600 sph ingrowth).

The tables are based on the expected future species mix derived from Table 19 of Timberline (1999). The site indices used are weighted averages from Martin (1999) and can be considered inclusive of an OGSI site index adjustment. They do not, however, incorporate gains from stand management activities proposed under the strategies to improve the quantity of future timber supply.

Table 1 illustrates the effects of spacing on achieving a technical rotation (sawlog targets of 22.5 (Pl) or 27.5 cm DBH, depending upon species) at younger ages. For example, rows 1 & 2 show that by spacing a Pl stand from 3 000 sph to 1 600 sph, a 22.5 cm DBH avg diameter target can be reached at 67 years vs at 81 years for the unspaced stand. The MAI of the spaced stand is also higher than that of the unspaced stand, indicating that spacing would also marginally increase the harvest level over time. Under the assumptions employed, even with spacing, only 1.7% (row 21) of annual harvested volumes in the long term will be large premium logs (42.5+ cm DBH).

Table 2 shows that for stands managed to younger harvest ages (Pl – 60, other species – 80), spacing increases the relative large log content by about 50%. However on an absolute basis, spacing only increases the large log content from 1.2% of future harvested volumes to 1.7%. Perhaps more significantly, in the Arrow TSA where improving availability is important, Table 2 shows spacing significantly reduces the number of smaller trees in the stand and increases those in the middle size range, while still maintaining about the same overall stand volume. For example, spacing Pl from 3 000 sph to 1 200 sph (row 1 vs row 3 reduces the # stems/ha in the 15-25 cm class by over 400 and more than doubles the # stems/ha in the 30-40 cm DBH class from 85 to 191 sph. Total stand volume at 1 200 sph is only 9 m3 less than at 3 000 sph. Similar shifts are shown for spruce stands. Similar but lesser trends are shown for Fdi stands, which appear to have a very high natural mortality rate in TIPSY. This would indicate that spacing priority should be given to over-stocked Pl and spruce leading stands over Fdi leading stands.

Table 2 shows spacing stands to low densities (i.e. to 900 sph for Pl and 1 000 sph for Fdi & S) results in noticeably lower stand volumes and MAI than in either unspaced or mid-range spaced stands. These lower density impacts disappear when stands are managed to older ages however, as shown by comparisons with Table 3. At older ages, densities would have to be lower than those shown in the tables to cause significant reductions in total stand volume.

Table 3 shows that even without spacing, managing stands to older ages substantially increases the large log content, to an estimated 7.0% of total harvested volume. Spacing 600 ha/yr raises this figure to 8.2%. This table shows MAI gains of 6-8% across all species when stands are spaced down from 3 000 sph. Table 3 also shows that, as in Table 2, spacing substantially lowers the number of trees in the smallest diameter groups and raises the number in the mid-range sawlog sizes.

## Table 1. Large log (45+cm) analysis - Target harvest diameters

Spacing reduces the harvest age at the target DBH by 14 to 34 years.

Spacing can increase MAI (e.g. 4.77 when spaced to 1600 vs 4.61 unspaced). However, spacing to lower densities (i.e., to 1200 or 900 sph) decreases MAI when stands are harvested at early ages. Table 3 shows virtually no difference in MAI at these lower densities when stands are all harvested at age 90.

**Target - 27.6 cm DBHg (22.6 for Pl)**

| | | | | | Reference | | | Target | | | | Total | | Largest 250 | | DBH class¹ | | | | | | | | | | | | | | Space 600 ha | | | No Spacing | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | 0 - 10 cm | | 15 - 25 cm | | | | 30 - 40 cm | | | | 45+ cm | | | | Regime Area | | | | |
| Row # | Species | %inv | SI² | Space frm/to | Cut Age | Cut Vol | Cut MAI | DBHg -all | Harv Age | Harv Ht (m) | MAI | Vol | Trees | Vol | DBHg | # trees | % tot trees | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | spaced | not spaced | 5m large log 3 % tot hrvst vol | Regime Area | 5m large log 3 % tot hrvst vol |
| 1 | $Pl_5F_3S_2$ | 18 | 22 | plt3000/unspaced | 73 | 341 | 4.67 | 22.5 | 81 | 26.5 | 4.61 | 373 | 1105 | 196 | 32.2 | 148 | 13 | 731 | 66 | 200 | 54 | 226 | 20 | 171 | 46 | 2 | 0 | 3 | 1 | | | N/A | 100 | 0.0 |
| **2** | | | | **plt3000/1600** | **73** | **350** | **4.80** | **22.5** | **67** | **23.7** | **4.77** | **320** | **1064** | **154** | **30.4** | **82** | **8** | **798** | **75** | **201** | **63** | **183** | **17** | **117** | **37** | **1** | **0** | **1** | **0** | **100** | | **0.0** | | **N/A** |
| 3 | comparison | | | plt3000/1200 | 76 | 354 | 4.66 | 22.5 | 56 | 20.8 | 4.24 | 237 | 895 | 122 | 29.2 | 70 | 8 | 669 | 75 | 152 | 64 | 156 | 17 | 85 | 36 | 0 | 0 | 0 | 0 | | | N/A | | N/A |
| 4 | comparison | | | plt3000/900 | 83 | 379 | 4.57 | 22.5 | 47 | 18 | 3.43 | 161 | 702 | 91 | 27.3 | 33 | 5 | 553 | 79 | 108 | 67 | 116 | 17 | 53 | 33 | 0 | 0 | 0 | 0 | | | N/A | | N/A |
| 5 | comparison | | | plt2000/unspaced | 74 | 349 | 4.71 | 22.5 | 73 | 25 | 4.71 | 344 | 1104 | 172 | 31.4 | 110 | 10 | 786 | 71 | 199 | 58 | 207 | 19 | 141 | 41 | 2 | 0 | 3 | 1 | | | N/A | | N/A |
| **6** | | | | **plt1200/unspaced** | **78** | **355** | **4.56** | **22.5** | **55** | **20.5** | **4.02** | **221** | **883** | **111** | **28.5** | **41** | **5** | **704** | **80** | **151** | **68** | **138** | **16** | **70** | **32** | **0** | **0** | **0** | **0** | | **188** | **0.0** | **188** | **0.0** |
| 7 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 100 | 188 | | 288 | |
| 8 | $Fd_4S_6$ | 55 | 23 | plt3000/unspaced | 85 | 419 | 4.93 | 27.5 | 100 | 33.8 | 4.79 | 479 | 811 | 353 | 39.9 | 83 | 10 | 383 | 47 | 100 | 21 | 295 | 36 | 302 | 63 | 50 | 6 | 95 | 20 | | | N/A | 350 | 1.1 |
| **9** | | | | **plt3000/1200** | **85** | **443** | **5.21** | **27.5** | **76** | **28.9** | **5.15** | **392** | **760** | **261** | **37.1** | **40** | **5** | **382** | **50** | **102** | **26** | **314** | **41** | **262** | **67** | **24** | **3** | **38** | **10** | **350** | | **0.5** | | **N/A** |
| 10 | comparison | | | plt3000/1000 | 85 | 446 | 5.25 | 27.5 | 69 | 27.1 | 5.08 | 350 | 705 | 231 | 35.9 | 31 | 4 | 353 | 50 | 97 | 28 | 301 | 43 | 233 | 67 | 19 | 3 | 29 | 8 | | | N/A | | N/A |
| 11 | comparison | | | plt2000/unspaced | 84 | 423 | 5.03 | 27.5 | 92 | 32.4 | 4.99 | 459 | 828 | 324 | 39.2 | 58 | 7 | 419 | 51 | 106 | 23 | 313 | 38 | 299 | 65 | 38 | 5 | 72 | 16 | | | N/A | | N/A |
| **12** | | | | **plt1200/unspaced** | **85** | **437** | **5.15** | **27.5** | **78** | **29.4** | **5.11** | **398** | **782** | **261** | **37.2** | **28** | **4** | **414** | **53** | **111** | **28** | **313** | **40** | **255** | **64** | **25** | **3** | **41** | **10** | | **530** | **0.9** | **530** | **0.9** |
| 13 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 350 | 530 | | 880 | |
| 14 | $S_6Pl_4$ | 27 | 18 | plt3000/unspaced | 93 | 343 | 3.69 | 27.5 | 137 | 30.1 | 3.16 | 432 | 750 | 263 | 35.6 | 3 | 0 | 440 | 59 | 156 | 36 | 295 | 39 | 258 | 60 | 13 | 2 | 23 | 5 | | | N/A | 180 | 0.1 |
| **15** | | | | **plt3000/1200** | **93** | **363** | **3.91** | **27.5** | **96** | **25.6** | **3.89** | **373** | **786** | **217** | **35.5** | **7** | **1** | **441** | **56** | **127** | **34** | **325** | **41** | **234** | **63** | **13** | **2** | **18** | **5** | **150** | | **0.1** | | **N/A** |
| 16 | comparison | | | plt3000/1000 | 96 | 371 | 3.86 | 27.5 | 85 | 23.9 | 3.83 | 326 | 727 | 195 | 35.0 | 10 | 1 | 383 | 53 | 105 | 32 | 326 | 45 | 215 | 66 | 8 | 1 | 12 | 4 | | | N/A | | N/A |
| 17 | comparison | | | plt2000/unspaced | 93 | 357 | 3.83 | 27.5 | 127 | 29.2 | 3.40 | 432 | 804 | 252 | 36.8 | 2 | 0 | 472 | 59 | 156 | 36 | 315 | 39 | 256 | 59 | 15 | 2 | 26 | 6 | | | N/A | | N/A |
| **18** | | | | **plt1200/unspaced** | **93** | **355** | **3.82** | **27.5** | **102** | **26.4** | **3.77** | **384** | **819** | **215** | **35.5** | **3** | **0** | **471** | **58** | **137** | **36** | **334** | **41** | **234** | **61** | **11** | **1** | **17** | **4** | | **282** | **0.2** | **282** | **0.0** |
| 19 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 150 | 282 | | 432 | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **21** | **Total** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **600** | **1000** | 1.7 | 1600 | 2.1 |

Not a valid comparison. Unspaced stands take longer to reach target DBH and so have more large logs at these older ages.

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[1] Actual ranges are 0 - 12.5 cm, 12.6 - 27.5 cm, 27.6 - 42.5, and 42.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, not a % of stand volume.

## Table 2. Large log (45+cm) analysis - Target harvest ages Pl 60 / Other species 80

Total volume falls 9 m3, about 3% below that of the unspaced stand.

Average diameter increases 5 cm.

# of non-merch trees is 1/6th that of the unspaced stand. Has implications for planting, visual quality, and fire hazard.

Over 400 fewer small diameter trees.

More that twice the number of mid-diameter trees having twice the percentage of total volume.

Target - Harvest at age 80 (Pl - 60)

| Row # | Species | %inv | SI² | Space fm/to | Reference Cul Age | Reference Cul Vol | Reference Cul MAI | DBHg -all | Target Harv Age | Harv Ht (m) | MAI | Total Vol | Total Trees | Largest 250 Vol | Largest 250 DBHg | DBH class¹ 0 - 10 cm # trees | 0 - 10 cm % tot trees | 15 - 25 cm # trees | 15 - 25 cm % tot trees | 15 - 25 cm vol | 15 - 25 cm % tot vol | 30 - 40 cm # trees | 30 - 40 cm % tot trees | 30 - 40 cm vol | 30 - 40 cm % tot vol | 45+ cm # trees | 45+ cm % tot trees | 45+ cm vol | 45+ cm % tot vol | Space 600 ha Regime spaced | Space 600 ha Area not spaced | Space 600 ha 5m large log 3 % tot hrvst vol | No Spacing Regime Area | No Spacing 5m large log 3 % tot hrvst vol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pl₆F₂S₂ | 18 | 22 | pl3000/unspaced | 73 | 341 | 4.67 | 18.4 | 60 | 21.9 | 4.54 | 272 | 1617 | 120 | 27.4 | 367 | 24 | 1066 | 70 | 221 | 81 | 85 | 6 | 51 | 19 | 0 | 0 | 0 | 0 | | | N/A | 100 | 0.0 |
| 2 | | | | pl3000/1600 | 73 | 350 | 4.80 | 21.1 | 60 | 21.9 | 4.63 | 278 | 1131 | 127 | 28.6 | 110 | 10 | 894 | 79 | 203 | 73 | 127 | 11 | 74 | 27 | 0 | 0 | 0 | 0 | 100 | | 0.0 | | N/A |
| 3 | comparison | | | pl3000/1200 | 76 | 364 | 4.66 | 23.3 | 60 | 21.9 | 4.38 | 263 | 876 | 130 | 30.3 | 59 | 7 | 626 | 71 | 151 | 57 | 191 | 22 | 111 | 42 | 1 | 0 | 1 | 0 | | | N/A | | N/A |
| 4 | comparison | | | pl3000/900 | 83 | 379 | 4.57 | 25.7 | 60 | 21.9 | 4.19 | 252 | 685 | 147 | 31.6 | 19 | 3 | 424 | 62 | 111 | 44 | 239 | 35 | 140 | 56 | 1 | 0 | 2 | 1 | | | N/A | | N/A |
| 5 | comparison | | | pl2000/unspaced | 74 | 349 | 4.71 | 20.1 | 60 | 21.9 | 4.53 | 272 | 1267 | 123 | 28.3 | 187 | 15 | 957 | 76 | 207 | 76 | 112 | 9 | 85 | 24 | 0 | 0 | 0 | 0 | | | N/A | | N/A |
| 6 | | | | pl1200/unspaced | 78 | 395 | 4.56 | 23.4 | 60 | 21.9 | 4.23 | 254 | 875 | 130 | 29.9 | 36 | 4 | 660 | 75 | 154 | 61 | 178 | 20 | 98 | 39 | 0 | 0 | 0 | 0 | | 100 | 0.0 | 100 | 0.0 |
| 7 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 100 | 100 | | 200 | |
| 8 | Fd₆S₄ | 56 | 23 | pl3000/unspaced | 85 | 419 | 4.93 | 23.7 | 80 | 29.9 | 4.91 | 383 | 1039 | 258 | 36.8 | 171 | 16 | 567 | 54 | 142 | 36 | 290 | 28 | 256 | 66 | 11 | 1 | 19 | 5 | | | N/A | 350 | 0.3 |
| 9 | | | | pl3000/1200 | 85 | 443 | 5.21 | 28.4 | 80 | 29.9 | 5.19 | 415 | 738 | 283 | 38.1 | 33 | 4 | 353 | 48 | 95 | 23 | 320 | 43 | 279 | 67 | 31 | 4 | 52 | 13 | 300 | | 0.7 | | N/A |
| 10 | comparison | | | pl3000/1000 | 85 | 446 | 5.26 | 29.9 | 80 | 29.9 | 5.23 | 418 | 663 | 290 | 38.8 | 18 | 3 | 280 | 42 | 79 | 19 | 326 | 49 | 284 | 68 | 38 | 6 | 63 | 15 | | | N/A | | N/A |
| 11 | comparison | | | pl2000/unspaced | 84 | 423 | 5.03 | 25.1 | 80 | 29.9 | 5.02 | 402 | 946 | 263 | 35.5 | 102 | 11 | 526 | 56 | 133 | 33 | 302 | 32 | 260 | 65 | 16 | 2 | 29 | 7 | | | N/A | | N/A |
| 12 | | | | pl1200/unspaced | 85 | 437 | 5.15 | 27.9 | 80 | 29.9 | 5.12 | 410 | 772 | 272 | 37.7 | 26 | 3 | 400 | 52 | 100 | 26 | 317 | 41 | 265 | 65 | 28 | 4 | 47 | 11 | | 530 | 0.9 | 530 | 0.9 |
| 13 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 350 | 530 | | 880 | |
| 14 | S₆Pl₄ | 27 | 18 | pl3000/unspaced | 93 | 343 | 3.69 | 20.4 | 80 | 23 | 3.54 | 283 | 1382 | 146 | 28.7 | 163 | 12 | 1079 | 78 | 235 | 83 | 141 | 10 | 90 | 32 | 1 | 0 | 1 | 0 | | | N/A | 150 | 0.0 |
| 15 | | | | pl3000/1200 | 93 | 363 | 3.91 | 25.2 | 80 | 23 | 3.79 | 303 | 857 | 170 | 33.1 | 24 | 3 | 561 | 65 | 142 | 47 | 268 | 31 | 160 | 53 | 4 | 0 | 5 | 2 | 150 | | 0.0 | | N/A |
| 16 | comparison | | | pl3000/1000 | 96 | 371 | 3.86 | 26.8 | 80 | 23 | 3.74 | 300 | 740 | 170 | 34.1 | 14 | 2 | 418 | 56 | 111 | 37 | 303 | 41 | 190 | 63 | 5 | 1 | 6 | 2 | | | N/A | | N/A |
| 17 | comparison | | | pl2000/unspaced | 93 | 387 | 3.83 | 21.9 | 80 | 23 | 3.70 | 296 | 1215 | 143 | 30.6 | 78 | 6 | 981 | 79 | 217 | 73 | 173 | 14 | 106 | 36 | 1 | 0 | 2 | 1 | | | N/A | | N/A |
| 18 | | | | pl1200/unspaced | 93 | 395 | 3.82 | 25.0 | 80 | 23 | 3.80 | 295 | 880 | 150 | 32.5 | 14 | 2 | 610 | 65 | 151 | 51 | 254 | 29 | 150 | 51 | 2 | 0 | 3 | 1 | | 282 | 0.0 | 282 | 0.0 |
| 19 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 150 | 282 | | 432 | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | Total | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 600 | 1000 | 1.7 | 1600 | 1.2 |

¹ Actual ranges are 0 - 12.5 cm, 12.6 - 27.5 cm, 27.6 - 42.5, and 42.6 + cm

² From Martin, 1999. *ISIS Polygon Area by Site Index Class*

³ 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, not a % of stand volume

## Table 3. Large log (45+cm) analysis - Target harvest ages Pl 90 / Other species 140

When planned for later harvest (age 90), stands can be spaced to lower densities. In this scenario, avg DBH is increase by over 6.5 cm.

Total volume increases slightly.

Over 375 fewer small diameter trees.

Almost 3/4's of the volume is in good-sized sawlogs.

**Target - Harvest at age 140 (Pl - 90)**

| Row # | Species | %inv | SI² | Space fm/to | Reference | | | | | | | Total | | Largest 250 | | DBH class¹ | | | | | | | | | | | | | | Space 600 ha | | | No Spacing | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Cul Age | Cul Vol | Cul MAI | DBHg all | Target Harv Age | Harv Ht (m) | MAI | Vol | Trees | Vol | DBHg | 0 - 10 cm | | 15 - 25 cm | | | | 30 - 40 cm | | | | 45+ cm | | | | Regime Area | | 5m large log³ % tot hrvst vol | Regime Area | 5m large log³ % tot hrvst vol |
| | | | | | | | | | | | | | | | | # trees | % tot trees | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | spaced | not spaced | | | |
| 1 | $Pl_5F_3S_2$ | 18 | 22 | plt3000/unspaced | 73 | 341 | 4.67 | 24.1 | 90 | 28.1 | 4.46 | 402 | 974 | 226 | 33.8 | 106 | 11 | 597 | 61 | 174 | 43 | 267 | 27 | 219 | 54 | 5 | 1 | 0 | 2 | | | N/A | 100 | 0.0 |
| **2** | | | | **plt3000/1600** | **73** | **350** | **4.80** | **26.1** | **90** | **28.1** | **4.62** | **416** | **863** | **235** | **34.9** | **35** | **4** | **512** | **59** | **155** | **37** | **308** | **36** | **248** | **60** | **7** | **1** | **12** | **3** | **100** | | **0.0** | | **N/A** |
| 3 | comparison | | | plt3000/1200 | 76 | 354 | 4.66 | 28.5 | 90 | 28.1 | 4.58 | 412 | 726 | 251 | 36.6 | 19 | 3 | 345 | 48 | 105 | 25 | 346 | 48 | 280 | 66 | 16 | 2 | 26 | 6 | | | N/A | | N/A |
| 4 | comparison | | | plt3000/900 | 83 | 379 | 4.57 | 30.8 | 90 | 28.1 | 4.56 | 410 | 623 | 263 | 37.9 | 7 | 1 | 219 | 35 | 69 | 17 | 373 | 60 | 303 | 74 | 25 | 4 | 37 | 9 | | | N/A | | N/A |
| 5 | comparison | | | plt2000/unspaced | 74 | 349 | 4.71 | 25.3 | 90 | 28.1 | 4.53 | 408 | 918 | 230 | 34.6 | 59 | 6 | 567 | 61 | 161 | 39 | 295 | 32 | 233 | 57 | 8 | 1 | 13 | 3 | | | N/A | | N/A |
| **6** | | | | **plt1200/unspaced** | **78** | **356** | **4.56** | **27.9** | **90** | **28.1** | **4.50** | **406** | **776** | **238** | **36.1** | **15** | **2** | **406** | **52** | **122** | **30** | **370** | **48** | **260** | **64** | **14** | **2** | **23** | **6** | | **188** | **0.2** | **188** | **0.2** |
| 7 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 100 | 188 | | 288 | |
| 8 | $Fd_6S_4$ | 55 | 23 | plt3000/unspaced | 85 | 419 | 4.93 | 32.8 | 140 | 39.2 | 4.09 | 572 | 592 | 487 | 44.7 | 30 | 5 | 225 | 38 | 61 | 11 | 226 | 38 | 260 | 45 | 112 | 19 | 256 | 45 | | | N/A | 350 | 2.4 |
| **9** | | | | **plt3000/1200** | **85** | **443** | **5.21** | **36.7** | **140** | **39.2** | **4.27** | **598** | **584** | **518** | **46.9** | **3** | **1** | **151** | **30** | **44** | **7** | **209** | **41** | **234** | **39** | **141** | **28** | **323** | **54** | **350** | | **3.0** | | **N/A** |
| 10 | comparison | | | plt3000/1000 | 85 | 446 | 5.25 | 37.9 | 140 | 39.2 | 4.33 | 606 | 479 | 527 | 47.5 | 2 | 0 | 122 | 25 | 37 | 6 | 205 | 43 | 228 | 38 | 150 | 31 | 343 | 57 | | | N/A | | N/A |
| 11 | comparison | | | plt2000/unspaced | 84 | 423 | 5.03 | 33.8 | 140 | 39.2 | 4.13 | 578 | 573 | 495 | 45.4 | 14 | 2 | 218 | 38 | 60 | 10 | 222 | 39 | 251 | 43 | 118 | 21 | 275 | 48 | | | N/A | | N/A |
| **12** | | | | **plt1200/unspaced** | **85** | **437** | **5.15** | **35.7** | **140** | **39.2** | **4.28** | **588** | **534** | **505** | **46.6** | **3** | **1** | **180** | **34** | **51** | **9** | **221** | **41** | **237** | **40** | **129** | **24** | **298** | **51** | | **530** | **4.2** | **530** | **4.2** |
| 13 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 350 | 530 | | 880 | |
| 14 | $S_6Pl_4$ | 27 | 18 | plt3000/unspaced | 93 | 343 | 3.69 | 27.8 | 140 | 30.3 | 3.11 | 436 | 734 | 268 | 35.8 | 2 | 0 | 419 | 57 | 151 | 35 | 297 | 40 | 253 | 60 | 15 | 2 | 26 | 6 | | | N/A | 150 | 0.1 |
| **15** | | | | **plt3000/1200** | **93** | **363** | **3.91** | **31.7** | **140** | **30.3** | **3.34** | **467** | **625** | **302** | **39.2** | **0** | **0** | **224** | **36** | **84** | **18** | **358** | **57** | **318** | **66** | **42** | **7** | **75** | **16** | **150** | | **0.4** | | **N/A** |
| 16 | comparison | | | plt3000/1000 | 96 | 371 | 3.86 | 33.0 | 140 | 30.3 | 3.37 | 471 | 587 | 313 | 40.2 | 0 | 0 | 168 | 29 | 63 | 13 | 368 | 63 | 319 | 68 | 52 | 9 | 90 | 19 | | | N/A | | N/A |
| 17 | comparison | | | plt2000/unspaced | 93 | 367 | 3.83 | 28.6 | 140 | 30.3 | 3.21 | 449 | 738 | 273 | 35.7 | 1 | 0 | 300 | 53 | 137 | 31 | 330 | 45 | 281 | 63 | 19 | 3 | 35 | 8 | | | N/A | | N/A |
| **18** | | | | **plt1200/unspaced** | **93** | **355** | **3.82** | **30.4** | **140** | **30.3** | **3.29** | **461** | **698** | **282** | **38.4** | **0** | **0** | **296** | **42** | **105** | **23** | **373** | **53** | **304** | **66** | **29** | **4** | **52** | **11** | | **282** | **0.5** | **282** | **0.8** |
| 19 | Subtot | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 150 | 282 | | 432 | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **21** | **Total** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | **600** | **1000** | **8.2** | **1600** | **7.8** |

[1] Actual ranges are 0 - 12.5 cm, 12.6 - 27.5 cm, 27.6 - 42.5, and 42.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

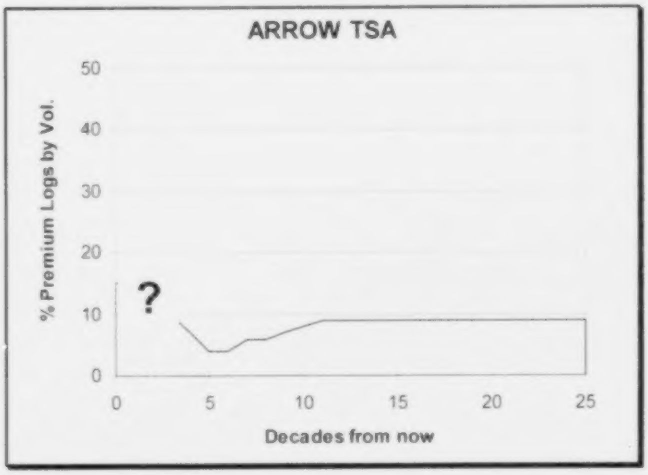
## 9.4 Timber Quality Forecast

The foregoing large log analysis indicates the premium log content of harvests in the mid and long term will be lower than today's levels. Premium logs will likely form 3-5% of total future harvest volume, given that the average age of harvested stands is likely to be somewhere between those used in Table 2 and Table 3. Data for the current local percentage of harvest that is in premium logs is not available, but could readily be obtained from local sawmills. In the interim it is assumed to be about 15%, the figure used in the provincial interim strategy document (MoF, 1999).

Postponing harvest to ages that are past culmination age would increase the large dimension component of premium logs, probably to between 7-10% of harvest (Table 3, page 64). Managing for older forests is a significant factor in this TSA, given the substantial forest cover requirements.

Spacing stands will increase the large premium log component of future harvests, but not to a great degree. More importantly, perhaps, spacing will make stands available for harvest earlier, increasing overall timber supply availability. Spacing Pl and spruce leading stands will also significantly shift the harvest from being mostly in a large number of small-diameter sawlogs to being mostly in mid-sized sawlogs. For Douglas-fir leading stands, the shifts are similar but much less dramatic. High natural mortality rates in the smaller diameter Fdi trees effect a natural spacing function.

**Figure 23. Potential Quality Forecast, Arrow TSA**



This quality forecast is for a combination of clear logs and large-premium logs. Best estimate is that large premium logs will likely form 3-5% of future harvests. With a substantial spacing program combined with harvesting at older ages, large premium logs could form 8-10% of long term harvest volumes.

Clear logs could form about 2.25% of future harvest volumes (based on pruning 300 ha/yr). Most clear logs will also be large logs. Without pruning there will be no clear logs from the majority of the 2nd growth forests.

# 10. Incremental Silviculture Strategy

This section synthesizes the preceding background information, workshop discussion and post-workshop analysis into a silviculture strategy for the TSA. Basic silviculture as required by the *Forest Practices Code of British Columbia Act* is assumed.

## 10.1 General Strategy

The IFPA base case timber supply analysis forecasts the initial harvest level (IHL) of 615 000 m3/yr can be maintained for only one decade, after which it will drop over the next several decades to a mid term low of 451 200 m3/yr starting in the 4th decade (about 27% below the IHL). The first objective of this strategy, therefore, is to minimize the anticipated reductions in short and mid term harvest levels. Workshop analysis indicates there are limited silvicultural opportunities for achieving this objective. (There are, however, other non-silvicultural opportunities that are being explored under the IFPA Forestry Plan).

The IFPA base case analysis indicates that not only is the harvest forecast to drop, but also that this forecast may be optimistic because the available timber supply is only slightly above the forecast harvest level. A secondary short and mid term objective, therefore, is to increase the overall availability of timber for harvesting, particularly over the next 100 years. Workshop analysis indicates that silviculture activities can significantly contribute to this objective.

Because of the limited silvicultural opportunities to overcome the forecast base case mid term reduction in timber supply, improving the quality of the timber to be harvested during this time period is a viable alternative. A higher quality, high value timber supply could mitigate to some extent the reduction in income and profit associated with the expected reductions in harvest levels. A mid term objective, therefore, is to improve the quality of the timber to be harvested in this time period. Programs of spacing, pruning and fertilization can accomplish this. Pending the outcome of further investigation, emphasis could be placed on cultivating rust-resistant white pine trees wherever suitable. Western white pine grows very fast, is relatively rare due to blister rust infestation and a limited growing range, and produces high value wood.

In the long term, starting about 90 years from now, workshop analysis indicates improved estimates of the productivity of forest land as well as silvicultural activities can result in harvest levels of at least equal to if not greater than current levels. The long term objective therefore is to create a timber supply capable of supporting a steady harvest level of at least 620 000 m3/yr. Workshop analysis indicates that silvicultural activities can contribute significantly to this objective.

Accomplishing these objectives requires an incremental silviculture program substantially above historic levels. Some changes in basic silviculture activities also present opportunities to contribute to the objectives.

## 10.2 Log Product Objectives

The following are product objectives at the log level for the Arrow TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | | |
| Peelers | All | 35+ cm DBH, clear, 5 m log, min 20 cm top. |
| Building Log | Douglas-fir, larch, lodgepole pine, spruce | 42.5+ cm DBH, straight, low taper, minimal twist, min 9 m log, min 27.5 cm top |
| Poles | western redcedar | 27.5+ cm DBH, 13 m log, straight, min 10 cm top, no rot. |
| Large logs* | All | 42.5+ cm DBH, 5 m log |
| White pine* | western white pine | 22.5+ cm DBH, tight knots. |
| **Sawlog:*** | All except lodgepole pine | 27.5+ cm DBH. |
| | lodgepole pine | 22.5+ cm DBH. |

* Values are enhanced when "clear" of knots.

## 10.3 Silviculture Strategies

The following strategies have identified potential to maintain and/or increase the quantity and quality of the timber supply of the Arrow TSA. Strategy numbers correspond with those recorded earlier.

### *10.3.1 Strategies to Increase the Quantity and Quality of Future Timber Supply*

Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them.

These strategies are supported by specific silvicultural regimes listed on page 72 along with investment priorities.

| No. | Strategy | Priority |
|---|---|---|
| Surveys | Conduct approximately 6 000 ha/yr of silviculture surveys in support of all strategies. | 1 |
| Surveys | Conduct approximately 1 600 ha/yr of retrospective OAF1 surveys over a 20 year period. | 1 |

## SHORT TERM

**Objectives:**

- Minimize the anticipated reductions in harvest levels.
- Increase the overall availability of timber for harvesting.

**Working Targets:**

- Maintain the current harvest level for at least 5 years.

**Strategies:**

| | | | |
|---|---|---|---|
| **ST2** | | Late rotation fertilize 400 ha/yr to produce approximately 3 000 m3/yr of additional harvest volume by the 2nd decade. | 3 |
| **ST 4** | | Improve timber availability by achieving green-up 6-8 years earlier in existing stands aged 1-20 years in the VQO zone outside of watersheds by: | |
| | **(b)** | spacing 150 ha/yr to prepare them for fertilization; | 4 |
| | **(e)** | fertilizing 300 ha/yr to reduce time until 7 m green-up by 2 years; and | 2 |
| | **(d)** | undertake a project to improve site index estimates with the expected result of reducing 7 m green-up ages by 5 years. | current IFPA project |

## MID TERM

**Objectives:**

- Minimize the anticipated reductions in harvest levels.
- Increase the overall availability of timber for harvesting.
- Improve the quality of the timber to be harvested.

**Working Targets:**

- Create a timber supply capable of supporting a minimum harvest level of at least 451 200 m3/yr.
- Generate at least 4% of total harvest volume in the later mid term in premium large logs.
- Generate at least 2¼ % of total harvest volume in the later mid term in clear premium logs (clear logs will generally also be large logs).

| No. | Strategy | Priority |
|---|---|---|
| **Strategies:** | | |
| **MT1** | Continue ST2: Late rotation fertilize 400 ha/yr to produce approximately 3 000 m3/yr of additional harvest volume. | 6 |
| **MT3** | Improve timber availability by reducing the minimum harvest ages of stands aged 1-20 years by undertaking the treatments specified in strategy ST4. | see ST4 |
| **MT5** | Reduce green-up ages of about-to-be-regenerated stands by 8 years in the VQO (base case - 28 yrs to 7 m ht) zone and by 10 years in the watershed zones (base case - 34 yrs to 9 m ht) by: | |
| **(b1)** | increasing the use of improved seed with the expected result of reducing 7 m green-up ages by 2 years; | 1 |
| | forming a licensee and MoF small business program seed planning and use co-operative to lobby for more and better improved seed and to co-ordinate the use of the best available seed to greatest strategic advantage; | |
| **(b2)** | undertaking a project to improve site index estimates with the expected result of reducing 7 m green-up ages by 5 years; and | current IFPA project |
| **(e)** | fertilizing 300 ha/yr at time of planting with the expected result of reducing 7 m green-up ages by 1 year. | 3 |
| **Q1** | Space 400 ha/yr of existing stands aged 1 – 30 years so that at least 60% of harvested volumes in the latter half of the mid term are good quality sawlogs. | 5 |
| **Q2** | Prune 300 ha/yr of existing stands aged 1 – 30 years in two lifts (= 150 ha/yr X 2 lifts) to create knot-free timber in the bottom 5.0 m log. | 4 |

## *LONG TERM*

**Objectives:**

- Maximize long term timber production within a context of sound multiple resource stewardship.
- Improve the quality of the timber to be harvested.

**Working Targets:**

- Create a timber supply capable of supporting a steady harvest level of at least 620 000 m3/yr.
- Generate at least 8% of total harvest volume in premium large logs (no current silviculture strategy implications).
- Generate at least 2¼ % of total harvest volume in clear premium logs (clear logs will generally also be large logs).

**Strategies:**

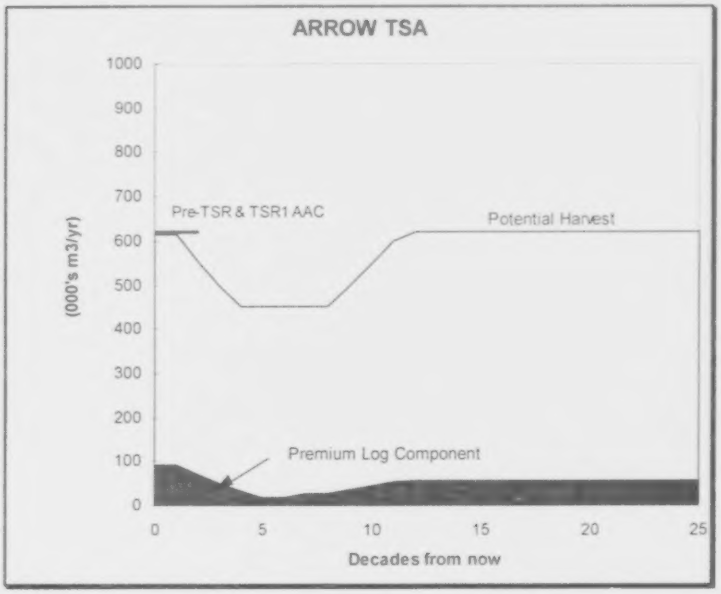
**LT1** Maintain the timber harvesting land base by:

| No. | | Strategy | Priority |
|---|---|---|---|
| | (a) | Treating approximately 400 ha of backlog NSR. | 1 |
| | (b) | Maintaining approximately 200 ha of previously reforested backlog plantations (Assumed to be required. No estimate of actual need available). | 2 |
| | (c) | Survey 2 000 ha/yr of pre-1987 SR area to ensure they remain fully stocked. | 1 |
| LT2 | | Increase the timber harvesting land base by 4.25% by: | |
| | (a) | Rehabilitating 2 000 ha of deciduous stands (= 1% of THLB) at the rate of 100 ha/yr. (Priority based on high cost and high risk of not achieving growth rates due to opposition to use of herbicides.) | 6 |
| | (e) | Rehabilitating 500 ha of fume kill (= 0.25% of THLB) at the rate of 100 ha/yr. (Requires integrated planning and design.) | 6 |
| | (f) | Rehabilitating 3 000 ha of permanent access structures (= 3% of THLB) at the rate of 150 ha/yr. (Priority based on high cost and low anticipated yield) | 5 |
| LT3 | | Increase the volume of regenerated stands by 40% by: | |
| | (b1) | Increasing the use of improved seed with the expected near term result of a 6% gain in LTHL, with a strategic target of 20% yield gain over the long term. | 1 |
| | (b2) | Undertaking a project to improve site index estimates with the expected result of a 34% gain in LTHL. | current IFPA project |
| | (j) | Repeat fertilizing 300 ha/yr, rising gradually over about 60 years to 1 250 ha/yr as more stands come under management, for an expected result of a 2% gain in LTHL. (Note: The initial 300 ha/yr are the same stands as in ST 4.) | 2 |
| LT6 | | Rehabilitate 100 ha/yr of old IU logged areas for the purpose of managing these areas for multiple non-timber values in order to lessen timber harvesting constraints elsewhere. | 7 |
| Q1 | | Continue mid term Q1 strategy. | 5 |
| Q2 | | Continue mid term Q2 strategy. | 4 |

### *10.3.2 Working Target Illustration*

*The preceding working targets for timber quantity and Figure 24 below incorporate an upwards adjustment for increased site productivity. Other, potentially negative influences may exist but are not specifically accounted for. The targets may require adjustment following the chief forester's TSR2 AAC determination.*

Figure 24. Combined Potential Quantity and Quality Harvest Forecasts, Arrow TSA



### 10.3.3 *Strategies to Increase the* Quantity *or* Quality *of Future Habitat Supply*

The following strategy has identified potential to increase the quality or quantity of the habitat supply of the Arrow TSA.

| No. | Strategy | Priority |
|---|---|---|
| | No specific strategies proposed at this time. See "Silviculture Regimes and Investment Priorities," page 72 for implications of specific silvicultural activities for habitat. | |

# 11. Silviculture Regimes and Investment Priorities

The following table indicates incremental silviculture regimes which are suitable to attaining the above working targets and strategies.

| Activities | Strategy | Opportunity Area (Ha) | Opportunity Area (Ha/Yr) | Timber Supply Effects | | | Quality | Habitat | Jobs Days/ha | Cost $/ha[1] | Wkshp Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Short | Medium | Long | | | | | |
| 1 Surveys (general) | all | 5355 /yr | 5355 | | | | | | 0.1 | 32 | |
| Survey - restrospective OAF (last 20 years) | M5(f2) | 1600/yr | 1600 | | | | | | 0.1 | 32 | 2 |
| Survey - pre 1987 SR | L1 | 2000 /yr | 2000 | | | | | | 0.1 | 32 | 2 |
| 2 Backlog reforestation | L1(a) | 300 /5yr | 60 | | + | + | | +/- | 2 | 925 | 1 |
| 3 Conversion - fume kill | L2(e) | 100 /5yr | 20 | | | + | | + | 6 | 3425 | 7 |
| 4 Conversion - decid | L2 (a) | 100 /20yr | 5 | | | | | - | 6 | 3425 | 7 |
| 5 rehab/reforest trails and landings | L2(f) | 150 /yr | 150 | ++ | ++ | ++ | | | 4 | 2725 | 6 |
| 6 Manage for OG structure; IU logging , riparian site prep, planting,brushing | L6 | 100/yr | 100 | | | + | | + | 3 | 1150 | 8 |
| 7 improved seed | M5(b1), L3 | | | + | ++ | +++ | ++ | | 0 | 80 | 2 |
| 8 space existing <21 yrs i VQO not Watershed | M3(b-c),M5(g .h), S4(b .c) | 150/yr | 150 | + | + | + | + | +/- | 3.5 | 1130 | 5 |
| 9 fertilization repeat | L2, L3 | 300 –> 1250/yr | | | | | | | | | |
| 10 fertilze existing <21 yrs i VQO not Watershed | M3(b-c),M5(g .h), S4(b .c) | 300 /yr | 300 | ++ | + | + | + | +/- | 0.1 | 300 | 3 |
| 11 fertil zation stands scheduled 2nd-4th dec | S2, M1 | 400 /yr | 400 | + | + | | | +/- | 0.1 | 300 | 4 |
| 12 fertilize at planting, VQO & Watershed | M5(e) | 300 /yr | 300 | ++ | + | | | + | 0.5 | 150 | 4 |
| 13 Pruning | Q2 | 300 /yr | 300 | | | | ++ | | 6 | 725 | 5 |

Notes
Activity 1 Area of general surveys is calculated as 3x are of the incrmental silviculture program.
Activity 9,10 Initially 300 ha/yr but rising to 1250 in the steady state; assume 300 ha/yr for 5 years (Activity 10).

# 12. Incremental Silviculture Program

The following annualized program will contribute to achieving the above goals and strategies. This program is considerably above historic levels and some activities may require phasing in.

**Program Table - Ha, Arrow TSA August 17-18, 1999**

| Year | Surveys* | Backlog Establish | Conversion/ Rehab | Space | Prune | Fertilize | Total |
|---|---|---|---|---|---|---|---|
| 1 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| 2 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| 3 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| 4 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| 5 | 8,955 | 60 | 275 | 150 | 300 | 1,000 | 10,740 |
| Subtot Yr 1 - 5 | 44,775 | 300 | 1,375 | 750 | 1,500 | 5,000 | 53,700 |
| 6 - 10 | 44,775 | - | 1,275 | 750 | 1,500 | 5,000 | 53,300 |
| Total Yr 1 - 10 | 89,550 | 300 | 2,650 | 1,500 | 3,000 | 10,000 | 107,000 |
| * Includes prescription and layout | | | | | | | |
| Unit cost ($/ha) | 32 | 925 | 2,825 | 1,130 | 725 | 255 | |

**Program Table - $ 000s, Arrow TSA August 17-18, 1999**

| Year | Surveys* | Backlog Establish | Conversion/ Rehab | Space - | Prune - | Fertilize - | Total |
|---|---|---|---|---|---|---|---|
| 1 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| 2 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| 3 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| 4 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| 5 | 287 | 56 | 777 | 170 | 218 | 255 | 1,761 |
| Subtot Yr 1 - 5 | 1,433 | 278 | 3,884 | 848 | 1,088 | 1,275 | 8,805 |
| 6 - 10 | 1,433 | - | 3,602 | 848 | 1,088 | 1,275 | 8,245 |
| Total Yr 1 - 10 | 2,866 | 278 | 7,486 | 1,695 | 2,175 | 2,550 | 17,049 |

# 13. Job Outcomes

The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets.

**Program Job Outcomes, Arrow TSA August 17-18, 1999**

*__Short term__ employment associated with undertaking the silviculture activity, in person years*

| Year | Surveys | Backlog Establish | Conversion/ Rehab | Space - | Prune - | Fertilize - | Total |
|---|---|---|---|---|---|---|---|
| 1 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| 2 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| 3 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| 4 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| 5 | 4.5 | 0.6 | 5.9 | 2.6 | 9.0 | 1.1 | 23.7 |
| Subtot Yr 1 - 5 | 22.4 | 3.0 | 29.5 | 13.1 | 45.0 | 5.5 | 118.5 |
| 6 - 10 | 22.4 | - | 27.3 | 13.1 | 45.0 | 5.5 | 113.3 |
| Total Yr 1 - 10 | 44.8 | 3.0 | 56.8 | 26.3 | 90.0 | 11.0 | 231.8 |

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job

*__Long term__ employment associated with improved quality and quantity of the timber resource*[1]

| Decade | Harvest Increment ('000 m3) | Incremental Jobs per year Region[2] | Incremental Jobs per decade Region[2] |
|---|---|---|---|
| 1 | (158) | (621) | (6,209) |
| 2 | (158) | (621) | (6,209) |
| 3 | (158) | (621) | (6,209) |
| 4 | (158) | (621) | (6,209) |
| 5 | (158) | (621) | (6,209) |
| 6 | (158) | (621) | (6,209) |
| 7 | (204) | (802) | (8,017) |
| 8 | (204) | (802) | (8,017) |
| 9 | (116) | (456) | (4,559) |
| 10 | (116) | (456) | (4,559) |
| 11 | (40) | (157) | (1,572) |
| 12 | (40) | (157) | (1,572) |
| 13 | (40) | (157) | (1,572) |
| 14 | (40) | (157) | (1,572) |
| 15 | (40) | (157) | (1,572) |
| 16 | (128) | (503) | (5,030) |
| 17 | (167) | (656) | (6,563) |
| 18 | (167) | (656) | (6,563) |
| 19 | (167) | (656) | (6,563) |
| 20 | (167) | (656) | (6,563) |
| 21 | (167) | (656) | (6,563) |
| 22 | (167) | (656) | (6,563) |
| 23 | (167) | (656) | (6,563) |
| 24 | (167) | (656) | (6,563) |
| 25 | (167) | (656) | (6,563) |
| Total | | | (134,367) |

Notes:

1. Assumes continuation of the silviculture program beyond the first 10 years, in accordance with the strategy. The total harvest increment is associated with all the silvicultural practices documented in the "Opportunities" section and is only partly attributable to spacing and fertilization practices. Some of the increase may be associated with pre-free growing silviculture that was not current practice at the time of strategy development.

2. Assumes 3.93 TSA level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre (Source: TFL 23 MP #9 Timber Supply Analysis Report, p.39)

## 14. Summary of Information and Research Needs

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for a silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 39).

1. Before considering excluded non-merch forest types for their rehabilitation potential, first determine their role/contribution in meeting OGMA objectives. (ST1(b))
2. Compare terrain hazard mapping vs inventory ESA's to refine THLB net-down impacts. (ST1 (x1))
3. Evaluate the regeneration implications of harvesting high elevation areas as an outcome of potentially moving the operability line higher. (ST1 (x2))
4. MoF to provide a map of ESA regen areas to AFLG to review for accuracy. (ST1 (x1))
5. Evaluate the late rotation fertilization potential of smaller live-crown trees. (ST2)
6. Model the changes in sensitivity to forest cover constraints attributed to the use of large patch sizes in meeting biodiversity objectives. (ST3)
7. Investigate the stocking levels of Fdi and spruce stands aged 21-30 years and other-species stands aged 11-20 years to determine if their yields are more accurately estimated using TIPSY. (MT4)
8. Evaluate the impact of the reduction in site preparation over the past 2 decades on site productivity and stand yield estimates. (MT5 (a))
9. AFLG to form a seed planning and use co-operative is proposed for the TSA licensees to lobby for more and better improved seed and to co-ordinate the use of the best available seed to greatest strategic advantage. (MT5 (b1))
10. Investigate access to white pine seed; investigate green-up potential; connect with TFL 23 to investigate success. (MT5 (d))
11. Evaluate efficacy of fertilization at planting and impact on reducing time to reach green-up. (MT5 (e))
12. Assess low end stocking levels of regenerated stands (e.g., 1 000 sph actual vs. 1 200 sph used in IFPA timber supply analysis) for yield implications. (MT5 (f1))
13. OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (MT5 (f2))
14. Confer with Fish and Wildlife Branch re Arrow Lake fertilization and effects of fertilization on fish bearing streams. (MT5 (i))
15. MoF to provide the AFLG a map of excluded low sites to review for reclassification/rehabilitation opportunities. (LT2 (d))

16. Investigate Invermere's root rot OAF2 estimate methodology and research. Further study of root rot management techniques and resultant OAF2 impact is needed. (LT4)
17. Investigate effects of juvenile spacing on mountain pine beetle resistance. (LT 5 (a))
18. Provide Daryl & UBC people with the silv strategy to take it into account in their studies/projects. Note the need to analyze the cost/benefit of silviculture expenditures to consolidate OGMA's with old IU logged areas in riparian areas. (LT 6)

# 15. References

Arrow Forest Licence Group. 1999. *Forestry Plan*. Internet website http://www.arrow-ifpa.com/forestry%20plan/

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Brockley, R.P. 1989. *Response of Thinned, Immature Lodgepole Pine to Nitrogen Fertilization: 3-year Growth Response*. FRDA Report 036. B.C. Ministry of Forests, Kalamalka Research Station and Seed Orchard, Vernon, B.C.

Hawe, Angela. 1996. *Review of Past Partial-Cutting Activities in the Nelson Forest Region (1988 - Present)*. Technical Report MIT-001, prepared for the B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. 67p.

Martin, Patrick. 1999. *ISIS Polygon Area by Site Index Class*. B.C. Ministry of Forests, Forest Practices Branch, Victoria, B.C.

Pedersen, Larry. 1995. *Arrow Timber Supply Area Rationale for allowable annual cut (AAC) determination*. Victoria, British Columbia. 41p + Attachments.

Reichenback, Gerald. 1996. *Effect of Silviculture Practices on Greenup Delay in the Nelson Forest Region*. Technical Report MIT-003, prepared for the B.C. Ministry of Forests, Nelson Forest Region, Nelson, B.C. 39p.

Timberline Forest Inventory Consultants Ltd. 1997. *Forest Level Benefits to Commercial Thinning and Fertilization*. Prepared for the B.C. Ministry of Forests, Forest Practices Branch, Victoria, British Columbia. 64p.

________. 1999. *Technical Report, Arrow IFPA Base Case Analysis Final Report*. Prepared for the Arrow Forest Licensee Group, Victoria, British Columbia. 64p.

Wang, Eric. 1999. *Personal Communication*. Timberline Forest Inventory Consultants, Victoria, BC.

Wang, Eric and John Pollack. 1998. *The Effects of Partial Cutting On the Wood Supply of the Arrow, Cranbrook and Golden TSAs*. MoF internal technical report prepared for the Kootenay-Boundary Forest Resource Task Force. Ministry of Forests, Nelson, BC. 37p.

# 16. Abbreviations

The following abbreviations may be used.

| | |
|---|---|
| AAC | allowable annual cut |
| AFLG | Arrow Forest Licensee Group |
| CF | chief forester |
| CT | commercial thinning |
| DBH | diameter at breast height |
| EFMPP | enhanced forest management pilot project |
| ESA | environmentally sensitive area |
| ESSF | engelmann spruce - subalpine fir (ecological zone) |
| FCC | forest cover constraints |
| FG | free growing |
| FRBC | Forest Renewal BC |
| ICH | interior cedar-hemlock (ecological zone) |
| IFPA | innovative forest practices agreement |
| IHL | initial harvest level |
| IRM | integrated resource management |
| KBLUP | Kootenay-Boundary Land Use Plan |
| LT | long term |
| LTHL | long term harvest level |
| LRSY | long run sustained yield |
| MAI | mean annual increment |
| MoELP | Ministry of Environment, Lands and Parks |
| MoF | Ministry of Forests |
| MS | montane spruce (ecological zone) |
| MT | mid term |
| NCBr | non-commercial brush |
| NSR | not satisfactorily restocked |
| OAF | operational adjustment factor |
| OLB | operable land base |
| SBFEP | small business forest enterprise program |
| SI | site index |
| ST | short term |
| TFL | tree farm licence |
| THLB | timber harvesting land base |
| TIPSY | table interpolation program for stand yields |
| TSA | timber supply area |
| TSR | timber supply review |
| VDYP | variable density yield projection |
| VQO | visual quality objective |
| WT | working target |

Species abbreviations: B or Ba - balsam fir; Cw - western redcedar; Fd - Douglas-fir; Fdi - interior Douglas-fir; Hw - western hemlock; Pl - lodgepole pine; Pw – western white pine; S - spruce species.

Site class abbreviations: G - good; M - medium; P - poor; L - low.

## Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement.
(Post improvement suggestions in Outlook to Public folders, all public folders, forests, forest planning, postings.)
The template design allows completion in a consistent format for all management units across the province.
Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized at the region level.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** Arrow TSA

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

12/2/2005

# Arrow TSA
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) | |
| **Stand Tending** | | | | | | | | |
| Surveys | 0 | 3000 | 3000 | 3000 | 3000 | 0.00 | 0 | LT1c |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Fertilizing | 0 | 300 | 300 | 300 | 300 | 0.00 | 0 | ST2, ST4e |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 0 | 3300 | 3300 | 3300 | 3300 | 0.00 | 0 | |
| Planning and prescriptions | | | | | | | 0 | |
| **Total dollars** | | | | | | | 0 | |
| **Forest Health Enhancement** | | | | | | | | |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Habitat Supply and Biodiversity Enhancement** | | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Domestic Range** | | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Enhanced Forestry Activities - Management Unit Total** | | | | | | | | |
| Surveys | 0 | 3000 | 3000 | 3000 | 3000 | 0.00 | 0 | |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Fertilizing | 0 | 300 | 300 | 300 | 300 | 0.00 | 0 | |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 0 | 3300 | 3300 | 3300 | 3300 | 0.00 | 0 | |
| Planning and prescriptions funding | | | | | | | 0 | |
| **Recommended studies funding** | | | | | | | 0 | |
| **Total dollars** | | | | | | | 0 | |

# Arrow TSA
# Backlog Program Table
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | | Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Legal Obligations** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | | Unit Cost ($/ha) | Funding ($) | |
| Surveys | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Site preparation | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Planting | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | Exempted from SP |
| Brushing | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| **Total legal obligations** | | | | | | | | 0 | |
| **Backlog Reforestation** | | | | | | | | | |
| Surveys | 2000 | 2000 | 2000 | 2000 | 2000 | | 25.00 | 50,000 | LT1 c |
| Site preparation | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Planting | 200 | 100 | 100 | 60 | 60 | | 500.00 | 100,000 | LT1 a |
| Brushing | 400 | 400 | 300 | 200 | 100 | # | 500.00 | 200,000 | LT1 a&b |
| **Totals hectares** | 2600 | 2500 | 2400 | 2260 | 2160 | | 134.62 | 350,000 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Prescriptions and planning dollars | | | | | | | | 0 | |
| **Total backlog reforestation** | | | | | | | | 350,000 | |
| **Impeded areas** | | | | | | | | | |
| Surveys | 300 | 0 | 0 | 0 | 0 | | 35.00 | 10,500 | |
| Brushing (Fish River) | 150 | 0 | 0 | 0 | 0 | | 1,000.00 | 150,000 | |
| Density spacing | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| **Totals hectares** | 450 | 0 | 0 | 0 | 0 | | 356.67 | 160,500 | |
| Prescriptions and planning dollars | | | | | | | | 0 | |
| **Total impeded areas** | | | | | | | | 160,500 | |
| **Site Restoration** | | | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Reforestation | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Prescriptions and planning dollars | | | | | | | | 0 | |
| **Total site restoration** | | | | | | | | 0 | |
| **Backlog Program Activities - Management Unit Total** | | | | | | | | | |
| Surveys | 2300 | 2000 | 2000 | 2000 | 2000 | | 26.30 | 60500 | |
| Site preparation | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Planting | 200 | 100 | 100 | 60 | 60 | | 500.00 | 100000 | |
| Brushing | 550 | 400 | 300 | 200 | 100 | | 636.36 | 350000 | |
| Density spacing | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| **Totals hectares** | 3050 | 2500 | 2400 | 2260 | 2160 | | 167.38 | 510500 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | | 0.00 | 0 | |
| Prescriptions and planning | | | | | | | | 0 | |
| **Recommended studies** | | | | | | | | 0 | |
| **Total backlog program** | | | | | | | | 510,500 | |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

# Arrow TSA
## Performance Measures Based on Activities Planned for 2001/2002
## Based on Type 1 silviculture strategy

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inputs | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 200 | 0 | 759 | 0 | 200 | 550 | 0 | 0 | 0 | 1,709 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 5,330 | 0 | 22,842 | 0 | 27,300 | 8,938 | 0 | 0 | 0 | | 64,410 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est.ha that will be reclassified as stocked (ha) | | | 0 | | | | | | | | 0 |
| 1.5 | Est. ha that will be declared as free growing (ha) | | | 0 | | | | | | | | 0 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 20 | 0 | 76 | 0 | 400 | 1,436 | 0 | 0 | 0 | 171 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 0 | 2 | 8 | 0 | 0 | 0 | 1 | 12 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# Arrow TSA
# Management Unit Summary Table
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 0 | 3,300 | 3,300 | 3,300 | 3,300 | 0 | 0 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| Backlog Program Field Activities | 3,050 | 0 | 0 | 0 | 0 | 167 | 510,500 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| **Totals** | 3,050 | 3,300 | 3,300 | 3,300 | 3,300 | | 510,500 |

**Performance Measures**

| | |
|---|---|
| Potential total merchantable volume increment in 65 years | 64,410 $m^3$ |
| Estimated ha that will be reclassified as stocked | 0 ha |
| Estimated ha that will be declared as free growing | 0 ha |
| Estimated total full time equivalent positions generated | 12 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

**Arrow TSA**
**Instructions and Input for completing the Performance Measures Table for Forest Renewal BC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more mgmt unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on Type 1 silviculture strategy**

## *The following default provincial factors may be replaced by management unit specific factors.*

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| **Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| **Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| **Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres.
These are estimates of annual growth rate increase from each type of treatment over no treatment.

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

3) Related corporate commitment is to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog planting from backlog table | 200 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 200 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 2,300 |
| 33% of all silviculture surveys | | | 759 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply (A) | | | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 759 |

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres.
These are estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 |

**Years the factor will affect:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%

**Provincial factors for estimated value gain at harvest**

| | | |
|---|---|---|
| 5-15% | 15-30% | 1-5% |

3) Related corporate commitment is to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## ***Area affected by tree improvement, seedling production and silviculture surveys***

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| Area | | |
|---|---|---|
| **Tree Improvement** | **Nursery Seedling Production** | **Silviculture Surveys** |

**A Tree Improvement**

**Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002**

Backlog planting from backlog table 200
Enter area of all other sites planted with improved trees
Total area affected by tree improvement 200

**B Nursery production of seedlings**

Enter sowing requests from SPAR

**C Silviculture surveys**

Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.
These potentially provide improved estimates of site productivity and operational yield adjustment factors

Total EFP surveys from the EFP table 0
Total backlog surveys from the backlog table. 2,300
33% of all silviculture surveys 759

**Optionally, you may provide a more exact estimate:**

Estimate area of regen delay surveys
Estimate area of free growing surveys
Estimate area of pre-stand tending surveys
Estimate of total surveys that will affect timber supply (A) 0

Surveyed area that will affect timber supply
Replace with (A) if a more exact estimate is calculated 759

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)
Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002

Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)
Estimate area that will be classified as free growing after a survey in 2001/2002

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure
Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity

# Arrow TSA
## Performance Measures Based on Activities Planned for 2001/2002
## Based on Type 1 silviculture strategy

| | Performance Measure | Tree Improve-ment | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 200 | 0 | 759 | 0 | 200 | 550 | 0 | 0 | 0 | 1,709 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 5,330 | 0 | 22,842 | 0 | 27,300 | 8,938 | 0 | 0 | 0 | | 64,410 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est.ha that will be reclassified as stocked (ha) | | | 0 | | | | | | | | 0 |
| 1.5 | Est. ha that will be declared as free growing (ha) | | | 0 | | | | | | | | 0 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 20 | 0 | 76 | 0 | 400 | 1,436 | 0 | 0 | 0 | 171 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 0 | 2 | 8 | 0 | 0 | 0 | 1 | 12 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# Boundary
# Timber Supply Area

## Interim Silviculture Strategy

-- Version 1.2 --

British Columbia
**Ministry of Forests**

**Funded By**

**Forest Renewal BC**

**January 10, 2000**

# Contents

1. Executive Summary ............................ 1

2. Introduction ............................ 9
  2.1 About the Interim Strategy ............................ 9
  2.2 Methodology ............................ 10
  2.3 Acknowledgements ............................ 10

3. Higher Level Goals and Objectives .... 11
  3.1 Provincial Goals and Objectives ............ 11
  3.2 Regional Objectives ............................ 12
  3.3 Higher Level Plans ............................ 12

4. Basic Data ............................ 13
  4.1 Land Area ............................ 13
  4.2 AAC 13
  4.3 Harvest Forecast ............................ 13
  4.4 Site Class ............................ 13
  4.5 Age Class ............................ 13
  4.6 Tree Species ............................ 13

5. Incremental Silviculture History .......... 14

6. Timber Harvesting Trends ................. 15

7. Issues and Silvicultural Opportunities. 16
  7.1 Discussion of Issues and Opportunities .... 16
  7.2 Summary of Issues and Silvicultural Opportunities ............................ 23

8. Opportunities to Increase Timber Supply ............................ 26
  8.1 Potential Silviculture Strategies ............. 26
  8.2 Workshop Review of Potential Strategies . 29
  8.3 Potential Harvest Forecast ..................... 44

9. Opportunities to Improve Timber Quality ............................ 45
  9.1 Product Objectives ............................ 45
  9.2 Potential Strategies by Response Time Frame ............................ 46
  9.3 Large Premium Log Analysis ................ 47
  9.4 Timber Quality Forecast ....................... 56

10. Incremental Silviculture Strategy ........ 57
  10.1 General Strategy ............................ 57
  10.2 Log Product Objectives ......................... 58
  10.3 Silviculture Strategies ........................... 58

11. Silviculture Regimes and Investment Priorities ............................ 62

12. Incremental Silviculture Program ........ 63

13. Job Outcomes ............................ 64

14. Summary of Information and Research Needs ............................ 65

15. References ............................ 66

16. Abbreviations ............................ 67

# 1. Executive Summary

### *Introduction*

This strategy is intended to help optimize the application of available funding for silviculture activities towards the goals of improving the future quantity and quality of both habitat and timber supply. The strategy will be considered as one of several inputs in decisions on funding allocations and treatment activities. The degree to which the overall strategy ultimately proves appropriate and is achieved will also be the degree to which the expressed targets will be achieved.

### *Objectives*

1. Because the TSR2 analysis is not yet available it is difficult to identify with any precision both the silvicultural opportunities and their relative importance. In its stead, the workshop participants relied on their own local knowledge of issues and opportunities as well as some expectation of what TSR2 may look like. While the TSR1 forecast suggests the existing harvest level can be maintained for many decades, in contrast forest companies are having difficulty finding available wood for harvest. The first objective of this strategy, therefore, is to undertake silvicultural actions that will enhance short term timber supply, both in terms of amount and availability. Workshop analysis indicates there is a potential for late rotation fertilization of some stands.
2. It is not possible to predict the shape of mid term timber supply in the absence of TSR2 information. A mid term objective, therefore, is to increase the quantity of the timber to be available for harvesting in this time period. Programs of spacing and fertilization can accomplish this.
3. In the long term, starting about 90 years from now, workshop analysis indicates silvicultural activities can result in at least 20% higher harvest levels. The baseline to which this is applied, however, must await TSR2 analysis. In the absence of this analysis, a long term objective is to maximize timber production within a context of sound multiple resource stewardship. Workshop analysis indicates that silvicultural activities can contribute significantly to this objective.
4. Based on a clear log definition of being able to produce 25% clear lumber by volume, 2nd growth managed stands will have no clear logs. A second long term objective is to create a long term timber supply yielding at least 1% clear logs on a total harvest volume basis.

Accomplishing these objectives requires an incremental silviculture program substantially above historic levels. Some changes in basic silviculture activities also present opportunities to contribute to the objectives.

## Product Objectives

The following are product objectives at the log level for the Boundary TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | Douglas-fir, spruce Pl Lw | 35+ cm DBH, clear 3-5 m log. |
| | larch, spruce | 30+ cm DBH, straight, low taper, building log |
| | western redcedar | 25+ cm DBH, pole |
| | lodgepole pine | 30+ cm DBH; large log |
| Sawlog: | western white pine | 30+ cm DBH, tight knots, premium species. |
| | Douglas-fir, larch, ponderosa pine, redcedar | 30+ cm DBH. |
| | lodgepole pine, spruce, balsam, hemlock | 25+ cm DBH. |

## Major Silvicultural Strategies

The strategies listed below are those considered in the workshop and follow-up analysis to be appropriate towards achieving the working targets. Other strategies that were considered but found to have no opportunity are documented in the report.

### Timber Quantity

Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them.

| Number | Strategy | Priority* |
|---|---|---|
| Surveys | Conduct approximately 5 400 ha/yr of silviculture surveys in support of all strategies. | |

*B - denotes basic silviculture item, the cost of which would be borne by licensees. Most items are current practice.

## SHORT TERM

**Objectives:**

- enhance short term timber supply, both in terms of availability and physical extent.

**Working Targets:**

- Maintain the current harvest level for at least 20 years.

**Strategies:**

| | | |
|---|---|---|
| **ST1** | Late rotation fertilize 530 ha/yr to produce approximately 8 000 m3/yr of additional harvest volume by the 2nd decade. | **5** |
| **ST2** | Commercially thin stands where needed to enhance timber availability when adjacency rules might otherwise constrain the harvest. | **As needed** |

## MID TERM

**Objectives:**

- Increase the quantity of timber to be available for harvesting.

**Working Targets:**

- Generate a potential additional 1.5 million m3 to mid-term timber supply.

**Strategies:**

| | | |
|---|---|---|
| **MT2** | Reduce green-up ages by 5 years in the IRM, VQO and Watershed zones, by: | |
| **(a)** | for existing stands: | |
| **(i)** | fertilizing 1 200 ha/yr of existing Pl/Fdi stands currently 1-2 m high; and | **B-3** |
| **(ii)** | spacing 2 000 ha of pre-87 repressed Pl stands that are currently 10-20 years old at the rate of 400 ha/yr (to speed up hydrologic recovery). | **2** |
| **(b)** | for about to be regenerated stands: | |
| **(i)** | using improved seed on all planted areas (1 440 ha/yr); | **B-1** |
| **(iii)** | using larger (415) planting stock on 300 ha/yr (current practice); | **B-2** |

| Number | | Strategy | Priority* |
|---|---|---|---|
| | | *B - denotes basic silviculture item, the cost of which would be borne by licensees. Most items are current practice | |
| | | **(viii)** Continuing MT2(a)(i) - fertilization 1 200 ha/yr of Pl/Fdi; | B-3 |
| | | **(ix)** include rust resistant white pine in plantations (500 ha/yr). | B-1 |
| **MT3** | | Set up Pl and Fdi stands (target stands having good access, even terrain and M to G site) for future partial harvesting or commercial thinning, by: | |
| | **(a)** | spacing 600 ha/yr; and | 3 |
| | **(b)** | repeat fertilizing 600 ha/yr (subset of LT3 (b)). (Alternatively may be fertilized 10-15 yrs prior to PH/CT and 2-3 yrs after, which would have no implications for current programs.) | 5 |

## *LONG TERM*

**Objectives:**

- Maximize long term timber production within a context of sound multiple resource stewardship.
- Improve the quality of the timber to be harvested.

**Working Targets:**

- Increase long term timber supply by at least 20%.
- Generate at least 7% of total harvest volume in premium large logs (no current silviculture strategy implications).
- Generate at least 1% of total harvest volume in clear premium logs (clear logs will generally also be large logs).

**Strategies:**

| | | | |
|---|---|---|---|
| **LT1** | | Maintain the timber harvesting land base by: | |
| | **(a)** | Planting approximately 300 ha of backlog NSR. | 1 |
| | **(b)** | Maintaining approximately 900 ha of previously reforested backlog plantations. | 2 |
| **LT3** | | Increase the volume of regenerated stands by 20% over those used at the base case by, in addition to those practices in MT 2: | |
| | **(b)** | Repeat fertilizing 1 200 ha/yr (as per strategies MT2(a) and MT3 (b)), rising gradually over about 60 years to 6 700 ha/yr as more stands come under management, for an expected result of a 6% gain in LTHL. | 5 |
| **LT4** | | Reduce losses to root rot by: | |
| | **(a)** | pushover logging/stumping 400 ha/yr on slopes < 30% (basic silvicul- | B-4 |

| Number | Strategy | Priority* |
|---|---|---|
| | ture; being phased out in favour of small-diameter spacing); | |
| (b) | planting Lw, Pw and Py on 1 440 ha/yr (basic silviculture); | B-2 |
| (c) | pop-up spacing 10 ha/yr; and | 6 |
| (e) | small diameter spacing 800 ha/yr (basic silviculture; being phased in as an alternative to stumping). | B-4 |
| Q1 | Space 500 ha/yr of existing (and future) stands with 5-7 000 sph down to levels in accordance with the district stand level strategy to increase average stand diameters. | 3 |
| Q2 | First-lift prune 100 ha/yr and $2^{nd}$ lift prune 50 ha/yr for a total pruning program of 150 ha/yr (target stands spaced to 800 sph and under repeat fertilization regime). | 4 |

*B - denotes basic silviculture item, the cost of which would be borne by licensees. Most items are current practice.

## *Illustration of Working Targets*

*Chart not available – pending TSR2 analysis results.*

## *Silviculture Regimes & Investment Priorities*

The following table indicates silviculture regimes which are suitable to attaining the above working targets and strategies.

| Regimes | Strategy | Opportunity Area (Ha/Yr) | Timber Supply Effects Short | Medium | Long | Quality | Habitat | Jobs Days/ha | Cost $/ha[1] | Workshop Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| **Survey** | | | | | | | | | | |
| 1 Surveys | | 5,400 | | | | | | 0.1 | 20 | 1 |
| **Backlog** | | | | | | | | | | |
| 2 NSR | L1 (a) | 100 | | + | + | | | 0.8 | 550 | 1 |
| 3 Brushing | L1 (b) | 400 | | | + | | +/- | 3.5 | 600 | 2 |
| **Pre FG** | | | | | | | | | | |
| 4 improved seed | M2(b)(i) | 1440 | | + | | | | 0 | 80 - B | B-1 |
| 5 larger planting stock | M2(b)(ii) | 300 | | + | | | | 0.5 | 153 - B | B-2 |
| 6 fertilize existing regen (accelerate greenup)[1] | M2(a-i)(b-viii) | 1200 | + | + | | | | 0.1 | 300 | B-3 |
| 7 plant Pw | M2(b)(ix) | 500 | | + | + | + | | 0 | B | B-1 |
| 8 space repressed Pl[2] | M2(a)(ii) | 400 | | + | + | + | + | 3.5 | 550 | 2 |
| 9 push-over /stumping | L4(a) | 400 | | | + | | - | 1 | B | B-4 |
| 10 plant alternative species(larch, Py, Pw, Ep) | L4(b) | 1440 | | | + | | + | 0 | B | B-2 |
| 11 small diameter spacing[2] | L4(e) | 800 | | + | + | | | 3.5 | 550 | B-4 |
| 12 pop-up spacing[2] | L4(c) | 10 | | + | + | | | 3.5 | 550 | 6 |
| **Post FG** | | | | | | | | | | |
| 13 spacing stands for future PH/CT[2] | M3 (a) | 600 | | + | + | + | + | 3.5 | 550 | 3 |
| 14 spacing stands for quality[2] | Q1 | 500 | | + | + | + | + | 3.5 | 550 | 3 |
| 15 Fertilize late rotation[1] | S1 | 530 | + | | | | + | 0.1 | 300 | 5 |
| 16 Fertilize (spaced (#13), planned for PH/CT)[1] | M3 (b) | 600 | | + | +/- | | + | | | 5 |
| 17 Prune (100 ha 1st lift, 50 ha 2nd lift) | Q2 | 150 | | | - | + | + | 6 | 965 | 4 |

Notes

[1] Total immediate fert = 2 330 ha/yr. Fert program could ultimately expand to a max. level of about 6700 ha/yr in about 60 years (see LT 3(b))

[2] Total spacing = 2 310 ha/yr. 800 of which is basic spacing for root rot control purposes. Total spacing will diminish over time as the spacing of existing Pl subject to repression is completed, and the basic spacing (800 ha - small diameter) ultimately reduces the area requiring later stocking control

B - denotes basic silviculture item, the cost of which would be borne by licensees. Most items are current practice

## *Incremental Silviculture Program*

The following annualized program will contribute to achieving the above goals and strategies. This program is considerably above historic levels and some activities may require phasing in. Spacing and fertilization goals are totals of several strategies. Lesser program levels should be oriented to specific target stands in accordance with the ranking shown in the regime table.

**Incremental Silviculture Program Table - Ha, Boundary TSA July 21-22, 1999**

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| Year | Surveys* | Establish | Maintain | Space Repressed | | | | Total |
| 1 | 5,400 | 100 | 400 | 400 | 1,110 | 150 | 2,330 | 9,890 |
| 2 | 5,400 | 100 | 300 | 400 | 1,110 | 150 | 2,330 | 9,790 |
| 3 | 5,400 | 100 | 200 | 400 | 1,110 | 150 | 2,330 | 9,690 |
| 4 | 5,400 | | 200 | 400 | 1,110 | 150 | 2,330 | 9,590 |
| 5 | 5,400 | | 100 | 400 | 1,110 | 150 | 2,330 | 9,490 |
| Subtot Yr 1 - 5 | 27,000 | 300 | 1,200 | 2,000 | 5,550 | 750 | 11,650 | 48,450 |
| 6 - 10 | 27,000 | - | 150 | - | 5,550 | 750 | 11,650 | 45,100 |
| Total Yr 1 - 10 | 54,000 | 300 | 1,350 | 2,000 | 11,100 | 1,500 | 23,300 | 93,550 |

* Includes prescription and layout

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Unit cost ($/ha) | 20 | 550 | 600 | 550 | 550 | 965 | 300 | |

**Program Table - $ 000s, Boundary TSA July 21-22, 1999**

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| Year | Surveys* | Establish | Maintain | Space Repressed | | - | - | Total |
| 1 | 108 | 55 | 240 | 220 | 611 | 145 | 699 | 2,077 |
| 2 | 108 | 55 | 180 | 220 | 611 | 145 | 699 | 2,017 |
| 3 | 108 | 55 | 120 | 220 | 611 | 145 | 699 | 1,957 |
| 4 | 108 | - | 120 | 220 | 611 | 145 | 699 | 1,902 |
| 5 | 108 | - | 60 | 220 | 611 | 145 | 699 | 1,842 |
| Subtot Yr 1 - 5 | 540 | 165 | 720 | 1,100 | 3,053 | 724 | 3,495 | 9,796 |
| 6 - 10 | 540 | - | 90 | - | 3,053 | 724 | 3,495 | 7,901 |
| Total Yr 1 - 10 | 1,080 | 165 | 810 | 1,10[illegible] | 6,105 | 1,448 | 6,990 | 17,698 |

* Includes prescription and layout

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes.

## *Job Creation*

The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets.

**Program Job Outcomes, Boundary TSA July 21-22, 1999**

***Short term*** *employment associated with undertaking the silviculture activity, in person years*

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| Year | Surveys* | Establish | Maintain | Space Repressed | - | - | - | Total |
| 1 | 2.7 | 0.4 | 7.0 | 7.0 | 19.4 | 4.5 | 1.2 | 42.2 |
| 2 | 2.7 | 0.4 | 5.3 | 7.0 | 19.4 | 4.5 | 1.2 | 40.4 |
| 3 | 2.7 | 0.4 | 3.5 | 7.0 | 19.4 | 4.5 | 1.2 | 38.7 |
| 4 | 2.7 | - | 3.5 | 7.0 | 19.4 | 4.5 | 1.2 | 38.3 |
| 5 | 2.7 | - | 1.8 | 7.0 | 19.4 | 4.5 | 1.2 | 36.5 |
| Subtot Yr 1 - 5 | 13.5 | 1.2 | 21.0 | 35.0 | 97.1 | 22.5 | 5.8 | 196.2 |
| 6 - 10 | 13.5 | - | 2.6 | - | 97.1 | 22.5 | 5.8 | 141.6 |
| Total Yr 1 - 10 | 27.0 | 1.2 | 23.6 | 35.0 | 194.3 | 45.0 | 11.7 | 337.7 |

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes.

## *Further Research and Information Needs*

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for an incremental silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 29.

1. Compare the actual post-harvesting stands in older partially harvested areas with inventory labels to (a) ensure the label correctly reflects the stocking of residual stands; and (b) determine how the residual stands are performing and if there is a need for silvicultural actions. (ST2 (a))
2. Better growth and yield information is needed for commercially thinned stands. The role of commercial thinning in enhancing timber availability when harvesting would otherwise be constrained should be investigated in the Type II strategy analysis. (ST2 (b))
3. Trials are needed to determine the effects on time until green-up of fertilizing stands 1-2 m tall. Trials should also investigate the fertilizer impact on the other vegetation in the stand and whether density control is needed prior to fertilization at early ages. (MT2 (a))
4. Pw management opportunities and harvest forecast implications need further investigation. (MT2 (b) (ix))
5. Following release of TSR2 analysis report, review the TSA sensitivity to a reduction in the age requirement for older forests. If the TSA is sensitive to this, revisit potential strategy MT4. (MT4)
6. Following release of TSR2 analysis report, review the extent of excluded deciduous areas to determine their potential and suitable silviculture treatments, if any. (LT2 (a))
7. OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (LT3 (a))
8. Further study of root rot management techniques and resultant OAF2 impact is needed. (LT4 - Summary)

# 2. Introduction

## 2.1 About the Interim Strategy

This strategy, and the process on which it is founded, is intended to help optimize the application of available funding for silviculture activities towards the goals of improving the future quantity and quality of both habitat and timber supply. The strategy will be considered as one of several inputs in decisions on funding allocations and treatment activities.

The limitations of time, budget and available information have tended to cause the focus in this first version of the strategy to be on the future quantity of the timber resource. It is expected that as the strategy development process evolves and as better and more information becomes available, the strategy will have more regard to the matters of future timber quality and the future quantity and quality of habitat supply.

To achieve the optimization objective, the opportunity evaluation process recorded herein is not limited by factors such as the availability of funding, funding source (e.g., public vs. private), or the ability to deliver a program. Because of this, the strategy generally illustrates the plausible high end of the potential of the timber resource. Within this context as well as a broad context of cost-effectiveness, available treatment opportunities, and operational realities -- all of which were explored in general terms in the workshop -- potential treatment activities are ranked. The end result hopefully points to the most effective and efficient means of at least partially achieving the working targets. The degree to which the overall strategy ultimately proves appropriate and is achieved will also be the degree to which the expressed targets will be achieved. This, of course, could also be affected by future unknowns, such as major changes in forest policy, land base available for timber production, or market demand.

Although this strategy focuses primarily on silviculture, it is recognized that silviculture is part of a suite of potential strategies which together may influence the future quality and quantity of habitat and timber supply.

This strategy should not be confused with the allowable annual cut (AAC)[1] determination process. AAC's are based on actual practice and current information at the time of the determination. This strategy, on the other hand, is about creating a future state of our forests. Again, the degree to which the strategy proves appropriate and is achieved may influence future, but not necessarily present, AAC determinations.

This strategy is founded on readily available information and the knowledge of forestry professionals. It is intended as an interim strategy until a more in-depth analysis-based review is completed.

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[1] See "Abbreviations," page 67 for a full listing of abbreviations used.

## 2.2 Methodology

This strategy was prepared through the following process:

1. Prior to the district workshop, in co-operation with district office personnel, L. P. Atherton & Associates undertook preliminary research to identifying issues and opportunities relevant to improving the future quantity and quality of timber supply.
2. A district workshop was held July 21 & 22, 1999 in Grand Forks, attended by representatives of the organizations and forest companies listed below. Larry Atherton of L. P. Atherton & Associates and Doug Williams of Cortex Consultants Inc. led the session. Participants reviewed the potential opportunities along with others that arose. The outcome of the session was a regime table, complete with priorities.
3. The consultants incorporated the results of the working session into the draft document and added forecasts of future harvest quantity and quality and of job outcomes.
4. After ministry review, the consultants submitted a completed strategy document to the Ministry of Forests (MoF) in electronic format as version 1.1. (The ministry will assign higher version numbers (e.g., 1.2, 1.3, etc.) as the strategy evolves and changes are made.)

## 2.3 Acknowledgements

The participation of the following persons and organizations at the district workshop is gratefully acknowledged.

| *Organization* | *Participant's Name* | *Title* |
|---|---|---|
| **Ministry of Forests, Boundary Forest District** | | |
| | Gord Lesergent | Incremental Silviculture Forester |
| | Jeff Leahy | District Planning Forester |
| | Dan Barron | Small Business Officer |
| **Ministry of Forests, Nelson Forest Region** | | |
| | Ivan Listar | Incremental Silviculture Forester |
| | Bernie Peschke | Forest Sectors Initiatives Officer |
| **Ministry of Forests, Forest Practices Branch** | | |
| | Frank Barber | Stand Management Specialist |
| **Pope & Talbot Ltd.** | | |
| | Randy Waterous | Forestry Planner |
| | Lyle LeClair | Silviculture Forester |

The project was directly managed by Ivan Listar of the Ministry of Forests, Nelson Forest Region. Funding was provided by Forest Renewal BC under a contract between the Ministry of Forests, Nelson Forest Region, and Cortex Consultants, Inc.

# 3. *Higher Level Goals and Objectives*

## 3.1 Provincial Goals and Objectives

The document, *Incremental Silviculture Strategy For British Columbia (Interim)*, states the Ministry of Forests' provincial level strategy. The strategy's executive summary is reprinted below. The provincial strategy was considered in the development of this TSA strategy.

### *STRATEGY AT A GLANCE*

| | |
|---|---|
| ***Purpose*** | This strategy provides guidance to the application of available funds for incremental silviculture activities. It is not tied to a specified funding level. |
| ***Government's Goals*** | • Sustainable Use<br>• Community Stability<br>• A Strong Forest Sector |
| ***Key Principles*** | 1. Because the distant future cannot be foretold, the best and only course of action in managing the timber resource is that which minimizes risk and maintains options.<br>2. British Columbia's forests are important locally, provincially, nationally and globally and should be managed in this context.<br>3. Each generation of British Columbians becomes the steward of the province's forest resources and has a moral obligation to preserve this heritage for future generations. |
| ***Working Targets*** | Within the context of the guiding principles:<br>WT 1: Minimize the anticipated interim reduction in timber supply so that provincial annual harvests of at least 65 million $m^3$ can be achieved during this period.<br>WT 2: Create a long term timber supply capable of supporting a steady long term provincial harvest level of at least 75 million $m^3$.<br>WT 3: Over the long term, maintain the production of premium quality logs at or above 10% of total harvest. |
| ***Major Silvicultural Strategies*** | • Increase the use of alternative silvicultural systems and commercial thinning.<br>• Achieve earlier green-up of harvested areas.<br>• Increase regenerated stand volumes 20%.<br>• Eliminate all pre-1982 good and medium site backlog NSR and all 1982 to 1987 backlog NSR.<br>• Initiate a long rotation quality management program for stands where harvesting must be delayed.<br>Other silvicultural and non-silvicultural strategies must also be implemented to achieve the working targets. |
| ***Strategy Implementation*** | Regional and management unit strategies must be developed, followed by programs and plans to implement them. |

It is recognized that not every management unit has the same capability to contribute to these interim objectives. Further, it is recognized that these objectives may not be attainable at current funding levels. Their purpose is to provide general guidance to the application of available funds.

## 3.2 Regional Objectives

The region has not set out formal regional silviculture objectives. In the interim, the provincial objectives are accepted as being broadly applicable within the region.

## 3.3 Higher Level Plans

Formal higher level plans are strategic plans defined by the Forest Practices Code, however, there are currently no approved higher level plans covering the Columbia Forest District. The Kootenay Boundary Land Use Plan has been approved but the decision whether to make it a higher level plan has not been finalized. Until that time it provides guidance for management practices.

There are other plans that exist at a higher level which are strategic (policies and guidelines), or operational that provide direction to any lower level of plans, prescriptions, or forest practices. These, however, are not higher level plans as defined under the Code.

# 4. Basic Data

## 4.1 Land Area

| Description | Area (ha) | Area % |
|---|---|---|
| Total Area of TSA | 580 100 | 100 |
| Total Productive Crown Forest | 425 100 | 73 |
| Net Timber Harv. Land Base | 311 300 | 54 |

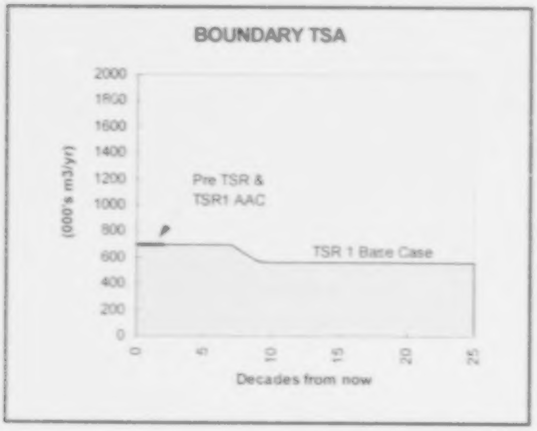
Source: TSR1 analysis report - rounded to nearest 100 ha.

## 4.2 AAC

| AAC Type | Pre-TSR | TSR1* | Change (%) |
|---|---|---|---|
| Conventional | 700 000 | 700 000 | 0.0 |
| Deciduous | - | - | |
| Insect/Disease | - | - | |
| Marginal | - | - | |
| Total | 700 000 | 700 000 | 0.0 |
| | | | |
| Woodlot AAC | | | |

*effective March 1/95

## 4.3 Harvest Forecast

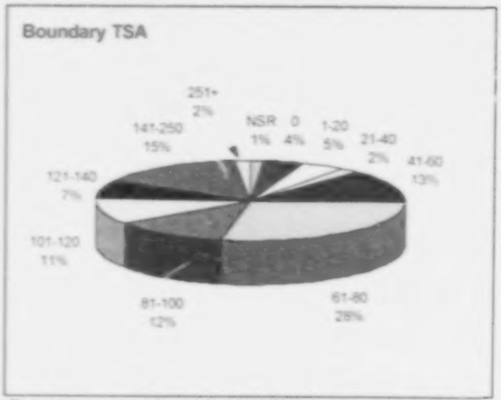


## 4.4 Site Class

Boundary TSA

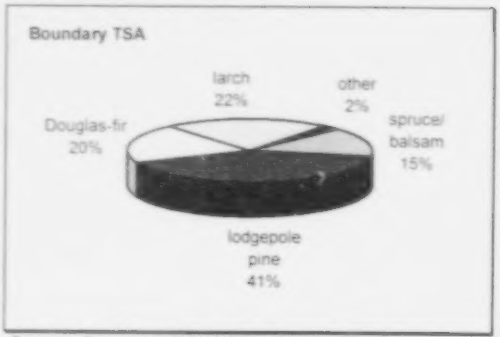
DATA NOT AVAILABLE

## 4.5 Age Class



Data interpreted from chart in TSR1 analysis report.

## 4.6 Tree Species



Source: Boundary TSA TSR 1 Discussion Paper

# 5. Incremental Silviculture History

| Treatment | TSR2 Status (1998)<br>Incorporated in Timber Supply Analysis | Not Incorporated in Timber Supply Analysis | Current Status (1999)<br>Source: BFD[2] |
|---|---|---|---|
| Backlog | | | Approximately 300 ha are planned for treatment. An additional 900 ha require brushing to ensure free growing is achieved. |
| Conversion | None. | | None |
| Commercial Thin | None. | | None |
| Space | TIPSY used for stands regenerated over the past 10 years. TSR2 managed stand yields will be based on current experienced initial stocking levels and post-spacing target densities. Assumes incremental spacing for stocking control on stands harvested prior to 1987 and either basic or incremental spacing thereafter. | | Recent spacing has been about 500 ha/yr. This is also the maximum past program level. By the end of fiscal 99/00, there will be a total of about 5 500 ha of spaced stands. There are presently 1 000 ha under approved prescription. |
| Prune | | | Recent level 70 ha/yr. Max past program of 90 ha/yr. Total accomplishment of 412 ha, 4 ha of which is 2 lift pruned. Many stands are now ready for 2nd lift. |
| Fertilize | | | Recent and max level 500 ha/yr. District is capable of higher program level. 500 ha currently under approved prescription. Total accomplishment of 760 ha: 136 ha in stands with CT potential, 90 of pruned stands and 534 ha of spaced stands. 253 ha have been fertilized twice. |

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[2] BFD - Boundary Forest District

# 6. *Timber Harvesting Trends*

Harvested area over the past five years (1994 to 1998, inclusive) has averaged approximately 2 800 ha/yr. Of this, about 2 200 ha/yr, or approximately 80% of the total, was managed under an even-aged silvicultural system (largely clearcutting). The other 600 ha/yr was managed under an uneven-aged silvicultural system. (Source: Boundary Forest District)

In terms of forecast future harvesting, the TSR1 analysis report (page 19) indicates approximately 2 500 ha/yr to be harvested over time, of which about 1 800 ha/yr, or 75%, will be under even-aged management.

# 7. *Issues and Silvicultural Opportunities*

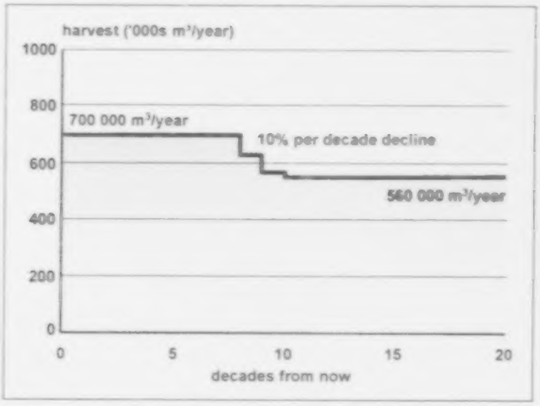
## 7.1 Discussion of Issues and Opportunities

TSA modelling in support of silviculture planning has not yet been undertaken. In its absence, sensitivity analyses from the TSR1 analysis report are the best available source of information as to the opportunities for incremental silviculture to increase future timber supply.

The following are selected sensitivity analsysis charts from the TSR1 analysis report. To the right of each chart is a brief discussion of the timber supply dynamics indicated by the chart, and associated silvicultural opportunities to influence these. In many cases, further modelling is required to confirm the indicated effects.

*(NOTE: The following analysis was prepared in advance of to the district workshop. During the workshop, participants indicated that much of the TSR1 information would be different or would be differently analyzed in TSR2. The end result is that many of the sensitivities and the underlying timber supply dynamics that drove the TSR1 sensitivity analysis results are likely to change, sometimes substantially. Where this is the case, this is noted in italics following the discussion text.)*

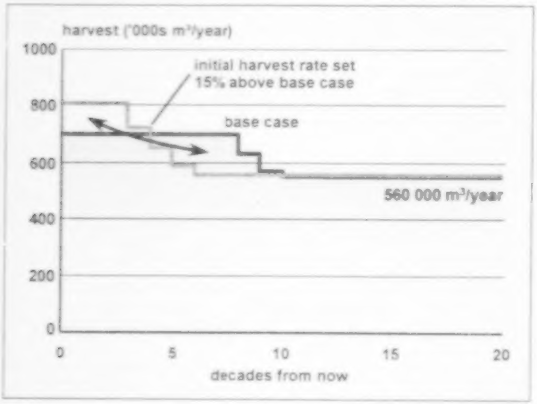
**Figure 1. TSR1 Base Case Harvest Forecast**



The TSR1 base case indicates the current harvest level can be maintained for 80 years. For TSR2, however, it can be expected that a smaller timber harvesting land base, tighter forest cover constraints and older forest requirements will put more pressure on the base case. Offsetting these will be higher regenerated stand volumes associated with better site productivity estimates (sensitivity test only) and shorter green-up periods.

For the purposes of this interim silviculture strategy, it is assumed the TSR2 base case forecast will remain relatively consistent with the TSR1 forecast.

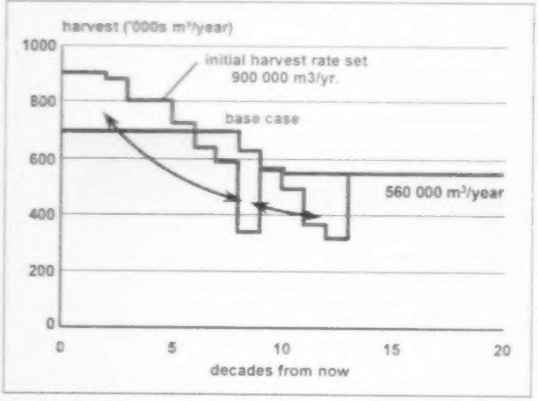
**Figure 2. The Potential for Increasing the Initial Harvest Level**



Harvest flow objectives require the initial harvest level to be maintained for as long as possible without causing undue disruption to future timber supply. In the Boundary TSA, timber that could otherwise be harvested early in the first 3 decades is held so as to extend the initial harvest level (current AAC) through decades 5-8. Other than harvest flow rules, there are no other constraints that prevent the initial harvest level from being raised to 800 000 m3/yr.

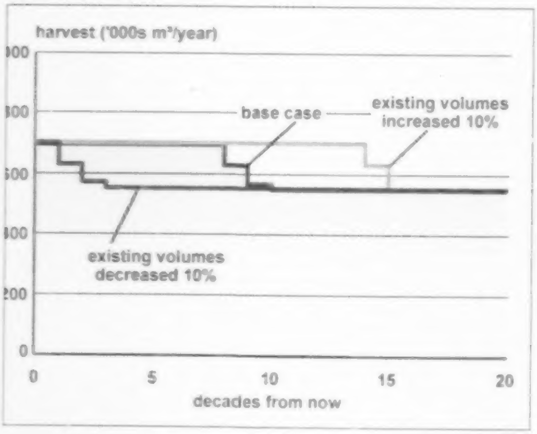
*(Licensees and the small business program are currently having difficulty locating available timber, which does not support this conclusion.)*

**Figure 3. The Effect of Harvest Flow Objectives on the Base Case**



Harvest flow objectives have a major impact on both the base case and the results of sensitivity analyses. In the base case, to avoid serious future harvest shortfalls, timber that otherwise could be available for harvesting in the first 5 decades is held until decades 8, 11 and 12. **It is the avoidance of these shortfalls, combined with harvest flow objectives, that controls the responses to many sensitivity tests.**

**Figure 4. Sensitivity to Changes in Existing Stand Volumes**

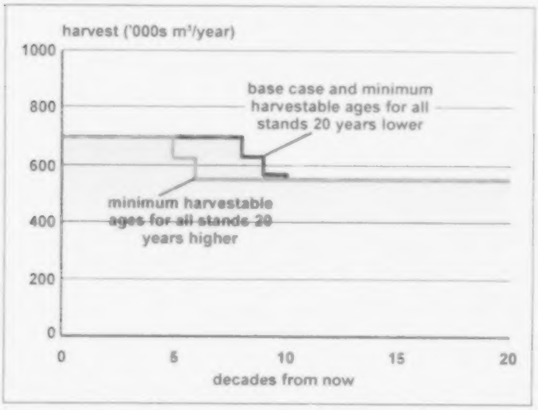


Increasing existing stand volumes 10% extends the initial harvest level another 6 decades beyond that in the base case. **This is the common response to the relaxation of constraints in most sensitivity tests and is largely dictated by harvest flow objectives.** Alternatively, as Figure 2 shows, the potential also exists to increase the initial harvest level above the current AAC.

A recent audit indicates inventory stand volume estimates to be acceptable, so the base case is not at risk from lower estimates. Nevertheless, the response to a lowering of existing volumes by 10% demonstrates the timber supply dynamics of the TSA. Lowering existing volumes causes the starting harvest level to be lowered much sooner than in the base case, not because there is a lack of timber early on, but to prevent a shortage of timber in later years (analysis report, p 26). Also, decreasing the volume/ha magnifies the impact of forest cover constraints. Lower volumes/ha require more area to be harvested to obtain the same volume. This increases the area not greened-up at a faster rate and the limits of forest cover constraints are reached sooner.

The TSA has a large fertilizable land base. Fertilization of suitable existing stands would increase their volumes and could contribute to extending or increasing the initial harvest level.

**Figure 5. Sensitivity to Changes in Minimum Harvestable Ages and Implications for Timber Quality Management**



TSR1 minimum harvestable ages are:

| Min Age | Species | Site Class |
|---|---|---|
| 60 | Pl, Pl mix | G, M |
| 80 | Pl, Pl mix | P |
| | All except Pl | G, M |
| 100 | Pl – dense | G, M |
| 120 | Pl – dense | P |
| | All except Pl | P |

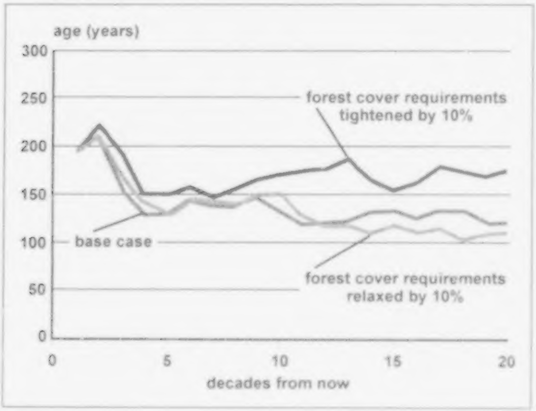
The TSR1 base case is not sensitive to a 20 year decrease in minimum harvest ages. The reason for this is discussed opposite Figure 6 below.

*(Discussions in the workshop indicated that the TSA may prove sensitive to minimum harvest ages in TSR2. A significant portion of current harvests is in younger stands.)*

Growing forests to older ages generally improves their quality. However, this chart indicates that doing so would substantially shorten the length of time the initial harvest level could be maintained, likely because this makes less timber available decades 8 to 11.

The objective of growing forests longer for quality may be more compatible over the very long term, where increasing harvestable ages does not appear to affect harvest levels. This would require additional analysis to confirm, however, because it is possible the model is slowly parcelling out over decades 10 –20 timber that has been saved from decades 4-9.

Figure 6. Changes in Average Harvested Age Related to a 10% Change in Forest Cover Constraints



After 40 years, the model harvests trees at an average of about 130 years of age – substantially above the minimum ages. Thus, as Figure 5 shows, lowering the minimum ages further has no effect on timber supply.

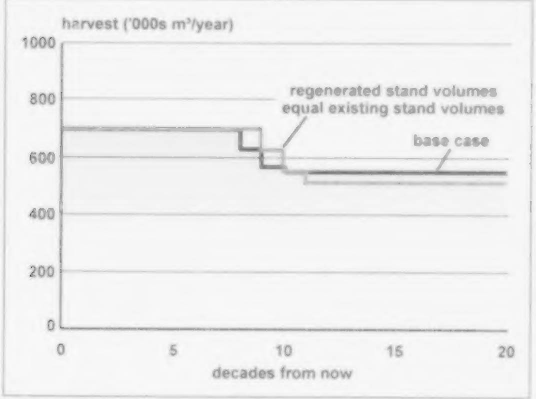
Figure 10 shows the TSA is highly sensitive to a 10% increase in forest cover constraints. As the figure to the left indicates, increased cover constraints also substantially increases the average age of stands harvested by the model (possibly the highest in the province).

The high ages are possibly linked to the low productivity of most regenerated stands (see Figure 7). The lower the average site productivity the larger the area that must be harvested annually to achieve a given harvest level. The larger the harvest area, the more sensitive the TSA becomes to green-up and adjacency constraints.

Higher ages may also be related to the 9 m green-up height in the wildlife zone (see discussion opposite Figure 9).

Increasing the productivity and harvestable volumes of regenerated stands will help alleviate the FCC's both through reduced green-up times and lowering the amount of area that must be harvested to achieve a given harvest level. Many silvicultural practices can be used to increase regenerated stand volumes.

Figure 7. Differences Between Regenerated and Managed Stand Volume Estimates

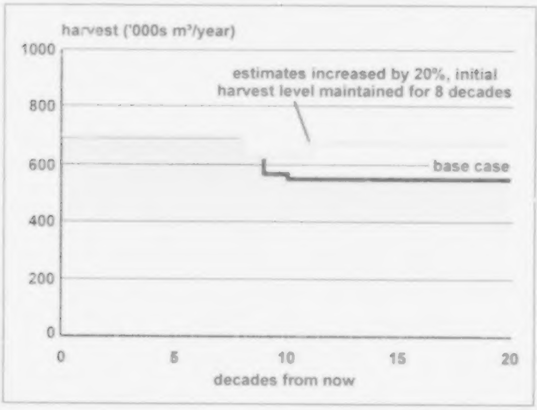


An 8% reduction in the long term harvest level (LTHL) occurs when regenerated stand volumes are made equal to existing stand volumes. This indicates the regenerated stand volumes in the base case average only 8% more than existing stand volumes. This is probably the lowest differential of all TSA's in the province. Appendix A.5 of the analysis report shows the MAI's of regenerated stands are often lower than that of the existing stands they replace.

Regenerated stand volumes may be underestimated. Volumes were reduced an additional 5% to account for root disease (Analysis Report, page 60). *(Note: discussion in the workshop indicated the 5% reduction is likely appropriate.)* The Old Growth Site Index project also indicates that volumes of certain regenerated stands are generally underestimated due to underestimates in site index.

Figure 8. Sensitivity to an Increase in Regener-

## ated Stand Volumes



Regenerated stand volumes may be underestimated (see discussion opposite Figure 7, above).

Increasing regenerated stand volumes by 20% results in a 20% increase in the long term harvest level (LTHL) over the base case. The resulting shortfall in decades 8-11 occurs because there is a limited amount of mature timber available during this period (analysis report, p 28). This is related to the lack of stands currently aged 21 to 40 years and therefore this scenario may show sensitivity to a reduction in minimum harvestable ages.

Many silvicultural practices can be used to achieve an increase in regenerated stand volumes, including practices to reduce losses to root disease.

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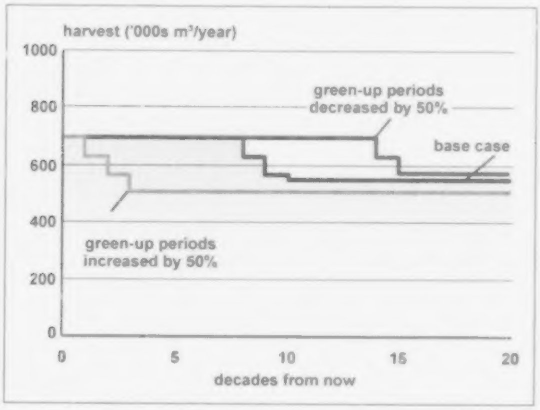
## Figure 9. Sensitivity to Changes in Green-up Ages



TSR1 green-up heights and ages are as follows:

| Zone | % THLB | Ht | Age | %allowed below age |
|---|---|---|---|---|
| IRM | 50 | 3 | 20 | 33 |
| Wildlife | 20 | 9 | 34 | 20 |
| Uneven Age | 23 | N/A | | N/A |

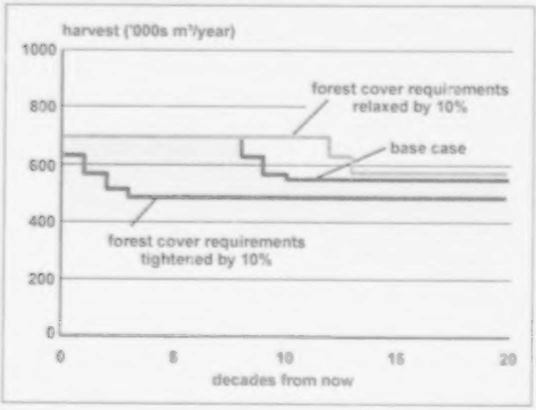
Allowing no more than 20% of the area in the wildlife zone to be below 9 m ht is particularly restricting, considering the zone also occupies 20% of the THLB.

Regional studies have indicated 3 m green-up ages used in TSR1 to be overestimated by about 5 years and 9 m ages to be reasonably accurate (Nelson region report MIT-003).

The sensitivity test to the left indicates reducing time until green-up by half (an ambitious target) results in a substantial increase in timber supply. Whenever timber supply is relieved in decades 8 to 12, timber flow objectives result in the initial harvest level being extended, rather than increasing the short term harvest level. Based on the modelled results, **directing efforts to overcoming green-up in the short term may have little direct impact on the critical periods of decades 8, 11 and 12. It may be that green-up is only critical in these latter few decades, with relieving green-up in the short term being inconsequential.** On the other hand, because licensees are having difficulty locating available timber in the short term, reality may be that green-up *is* a short term issue, regardless of the indications of timber supply modelling. *(This was confirmed in the workshop.)*

Many silvicultural practices can be used to reduce the time until green-up. There is little risk to focusing on green-up issues in the short term, because these same practices will also serve to increase regenerated stand volumes. Figure 8 shows this would also be of considerable long term benefit.

Figure 10. Sensitivity to Changes in Forest Cover Constraints

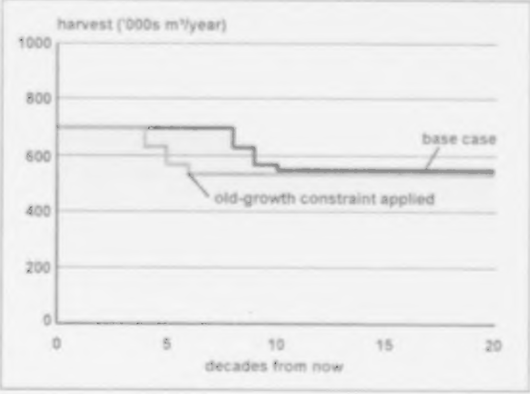


The TSA is highly sensitive to increased forest cover constraints (FCC's). Tighter FCC's than modelled in the base case may in fact already exist. Local companies and the MoF's small business program are having difficulty locating available timber for harvesting.

Boundary District staff believe forest cover constraints (FCC's) in the IRM zone are likely to be 25% of area not allowed below green-up (vs the 33% modelled in the base case). It is unclear, however, how much of the sensitivity in Figure 10 may be attributable to the IRM zone. **It may be more attributable to the wildlife zone where lowering the area allowed to be not greened-up by10% results in no more than 10% of this zone to be below 34 years of age (9 m ht.) at any one time.** The wildlife zone covers 20% of the THLB. This no doubt also contributes to the substantial increase in average harvest ages that occurs when FCC's are reduced by 10% (see Figure 6).

*(Workshop: TSR2 analysis will not have a wildlife zone with a 9m restriction, so while the wildlife zone limitation noted above is likely what drove the TSR1 sensitivity analysis, this won't be the case in TSR2. Workshop participants indicated that the two most limiting on-the-ground constraints at present are the biodiversity mature plus old requirement and the maximum clearcut area limitation of the Forest Practices Code. Also it was generally agreed that adjacency constraints are likely to continue to be limiting timber supply into the future.)*

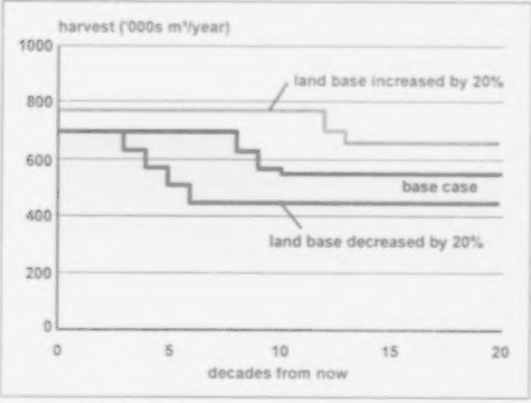
Figure 11. Sensitivity to the Application of an Older Forest Constraint



The TSR1 base case only had an old-growth constraint (10% of area must be at least 150 years old at all times) applied to the community watershed zone (4% of the THLB). Applying this constraint across all zones cuts the time the initial harvest level can be maintained in half. This harvest level drop begins at about the same time as the average harvested age falls to 130 years (see Figure 6). Given the relatively high average harvestable age, this response is somewhat unexpected. Again, this is likely a response to reduced timber availability in decades 8-11 that requires timber to be held over from earlier decades to fill in what would otherwise be a shortfall. [What do KBLUP restraint reports show?] Further analysis is required to isolate the cause of the sensitivity.

Increased older forest requirements will no doubt become part of the TSR2 base case to reflect FP Code biological diversity requirements. Silvicultural practices such as fertilization and commercial thinning may be used to accelerate stand structure so that the desired older forest attributes are achieved at an earlier age **in decades 8-11**. This could potentially free up some timber supply for harvesting in decades 4-8.

Figure 12. Sensitivity to Changes in the Size of the Timber Harvesting Land Base



Subsequent to the TSR1 analysis, the Kootenay-Boundary Land Use Plan has reduced the land base of the TSA. A sensitivity test of a 20% land base reduction shortens the time the initial harvest level can be maintained to 3 decades and correspondingly reduces the LTHL.

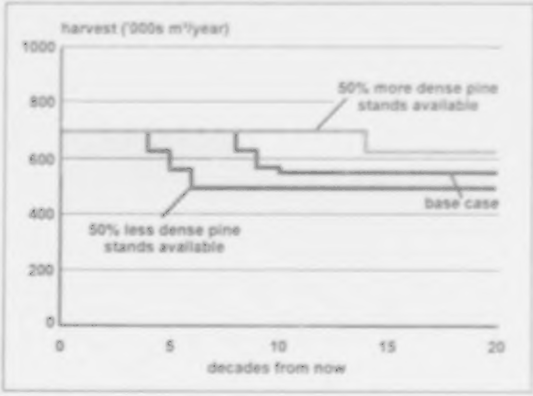
Silvicultural practices may be used to increase the size of the THLB through conversion of unutilized stands to merchantable species and to increase the productivity of low sites.

Opportunity area consists of the areas deducted from the TSR1 THLB. These include:

| Type | Area | Equiv % THLB |
|---|---|---|
| Low site | 3 600 | 1.2 |
| Decid | 3 400 | 1.1 |
| Non Merch | 14 200 | 4.6 |

There is little remaining treatable backlog NSR.

**Figure 13. Sensitivity to Changes in the Merchantability of Dense Lodgepole Pine Stands**



Dense Pl stands cover about 70 700 ha (23%) of the THLB. These stands were included in the TSR1 base case but assigned min harvestable ages 40 years greater than normal Pl stands. Removing half of these stands results in a substantial reduction in mid and long term harvest levels. (The sensitivity test for increasing the area available appears to be for illustration purposes because these stands don't exist.)

Are there silvicultural practices regarding dense stands that could make them more available?

## 7.2 Summary of Issues and Silvicultural Opportunities

At the time this interim strategy was prepared, the TSR2 analysis report for the Boundary TSA was not available. However, it can be expected that a smaller timber harvesting land base (due to KBLUP), tighter forest cover constraints and older forest requirements will put more pressure on the TSR 2 base case. Offsetting these will be higher regenerated stand volumes associated with better site productivity estimates (sensitivity test only) and shorter green-up periods. In the absence of the TSR2 analysis, for this interim strategy, it is assumed that the preceding factors will be largely offsetting and the base case will be similar in shape to that of the TSR1 forecast. The onset of the transition from the initial harvest level to the long term harvest level may occur sooner. Higher productivity among regenerated stand volumes may result in the model harvesting stands at lower ages, with a resultant sensitivity to a reduction in minimum harvestable ages occurring.

### *7.2.1 Future Timber Volumes (Quantity)*

Short Term (1 - 20 years)

The short term period is somewhat arbitrarily defined as the next 20 years.

The TSR2 base case is likely to indicate that harvest levels can be maintained at the current AAC throughout the short term period, unless forest cover constraints are increased substantially (see Figure 10).

In the TSR1 analysis, short term harvest levels are largely governed by the need to extend existing timber supply to cover what appears to be critical shortages in decades 8 to 11. Were the short term to be isolated from future timber supply difficulties it is likely that it would not of itself be sensitive to changes in any factors. This is because the short term has a relative abundance of available timber supply from which to satisfy constraints. Reality, however, is that licensees are having difficulty finding timber that is available for harvest.

Short term timber supply therefore may benefit from:

1. Activities that will reduce the critical shortages in decades 8-11;
2. Activities that will overcome currently experienced adjacency constraints, such as partial harvesting and commercial thinning;
3. Activities that will achieve-green-up earlier (likely a 2nd decade benefit at the earliest); and
4. Activities that will increase the volume of stands to be harvested in this time period (of which there is only one – fertilization of suitable stands).

The allocation of the potential benefit from the above activities is a matter of allowable annual cut policies and determinations. Under current policy, short term harvest levels are typically not increased as long as future harvest levels are indicated to decline. Therefore, in this strategy, all of the above potential activities would serve to maintain the existing base case harvest level.

### Mid Term (21 - 90 years)

The mid term period begins at the end of the short term period (i.e., 21 years from now) and continues until the transition from harvesting in existing natural stands to harvesting mainly in 2nd growth managed stands is complete. Until the TSR2 analysis is available it is not known when the end of the transition period will be. For the purposes of this strategy, it is assumed to be 90 years, the same as in TSR1.

Even more than the short term, the mid term is governed by the need to extend existing timber supply to cover what appears to be critical shortages in decades 8 to 11. Both the harvest flow objectives used in timber supply modelling and a diminishing growing stock contribute to the high degree of sensitivity of the mid term to changes in various factors.

Mid term timber supply may benefit from:

1. Activities that will reduce the critical shortages in decades 8-11, such as:
   (a) setting up stands now for commercial thinning in that period;
   (b) setting up stands now to meet older forest requirements in that period;
2. Setting up for and continuing activities that will overcome adjacency constraints that may exist in the early decades of the mid term, such as partial harvesting and commercial thinning;
3. Activities that will achieve-green-up earlier, so that green-up is not limiting on the ground; and
4. Activities that will increase the volume of stands to be harvested in this time period (of which, given the stands for harvesting in this time are predominantly existing stands, there is only one – fertilization of suitable stands).

Because it is in the later decades of the mid term period that activities that could reduce green-up restrictions in decades 8-11 would be instigated, this has no impact on a silviculture strategy oriented towards the next decade. *(Note: In the workshop, the mid term deficit in decades 8-11* *could not be confirmed as it was noted there will be no wildlife zone in TSR2 and the modelling methodology for wildlife constraints will be different.)*

Long Term (91 + years)

The long term period is the time when harvesting is primarily in managed 2nd growth stands and is characterized by a steady state harvest level.

In the absence of TSR2 information, the long term is assumed to be sensitive only to changes in managed stand volumes, the size of the timber harvesting land base, and the amount of losses to root rot diseases.

### 7.2.2 *Future Timber Quality*

To date there has been little attention to the matter of future timber quality. The focus of the timber supply review on AAC determination has resulted in the planning emphasis being solely on timber volumes. Until recently, there has been little higher-level policy guidance with respect to managing for future timber quality.

Using age as a surrogate measure of timber quality, the expected decline in harvest ages towards lower harvestable ages indicates future timber quality will be generally be lower than today's. The future timber supply will be much smaller in average diameter and, without pruning, there will be little, if any, clear wood. On the positive side, other than areas affected by root rot, most harvested second growth timber will be sound wood with little or no decay.

Smaller diameter material is not necessarily all negative in terms of timber quality. There is some evidence that slower grown, smaller diameter lodgepole pine produces a better proportion of machine stress rated (MSR) lumber, which currently commands a higher price than standard grade lumber.

If a "clear" log is defined as one having at least 25% clear lumber content (based on coastal log grading rules), then 2nd growth forests will have produce few if any such logs. Pruning will be necessary if future standing inventories are to contain any clear log content.

Lower quality stands present some future market risk. In low market periods it is often only the readily accessible, higher-quality timber that is profitable to harvest. Also, a narrow portfolio of small diameter timber offers less opportunity for creating a range of value-added forest products.

Timber quality can be improved through silviculture practices such as spacing, fertilization and pruning.

# 8. Opportunities to Increase Timber Supply

## 8.1 Potential Silviculture Strategies

Prior to the district workshop, information in the previous sections was used to identify the following potential silvicultural strategies for either maintaining or increasing future timber supply at the TSA level. Each of these was discussed in detail in the district workshop, the results of which are recorded in "Workshop Review of Potential Strategies," page 29, along with additional strategies that arose during the meeting. Strategies that are ultimately adopted are noted in "Silviculture Strategies," page 58.

### *8.1.1 Short Term (1 - 20 yrs)*

ST 1: Fertilize ____ ha/yr of existing stands scheduled for harvest in the 2nd decade to increase their volumes. (increase)[3]

ST 2: Commercial thin _____ ha/yr to overcome adjacency constraints.

ST3:

### *8.1.2 Mid Term (21 - 90 yrs)*

MT 1: Fertilize ____ ha/yr of existing stands scheduled for harvest 20 to 90 years from now to increase their volumes (continuation of ST 1). (increase)

MT 2: Reduce green-up ages by 5 years in the IRM, VQO and Watershed zones and by 10 years in the wildlife management zone by: (maintain)

(all zones, except uneven-aged management zone)

(a) site preparing ___ additional hectares;

(b) using improved seed;

(c) using larger planting stock;

(d) fertilizing at time of planting;

(e) brushing ____ ha/yr for growth enhancement (in addition to ___ ha/yr to ensure free growing; and

(wildlife zone only)

(f) spacing ____ ha/yr of pine stands subject to repression;

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[3] (Increase) means oriented to increasing harvest levels above those indicated by the TSR2 base case. (Maintain) means oriented to maintaining the harvest level indicated by the TSR 2 base case.

(g) spacing ____ ha/yr of Douglas-fir stands subject to seasonal moisture deficits; and

(h) fertilizing ____ ha/yr.

MT 3: Set up stands for future partial harvesting/ commercial thinning in the wildlife management zone (emphasis on decade 8-11 harvests):

(a) spacing ____ ha/yr of _____ to set up stocking appropriate to commercial thinning; and

(b) repeat fertilizing ____ ha/yr.

MT 4: Increase the area satisfying older forest biodiversity requirements in decades by achieving the desired stand characteristics by 130 years of age by:

(a) spacing ____ ha/yr; and

(b) repeat fertilizing ____ ha/yr.

### *8.1.3 Long Term (91+ yrs)*

LT 1: Maintain the THLB by

(a) Planting ____ ha of backlog NSR; and

(b) Maintaining ____ ha of existing backlog plantations.

LT 2: Increase the THLB by:

(a) converting/rehabilitating ____ ha/yr of deciduous stands; (increase)

(b) converting/rehabilitating ____ ha/y of non-merchantable ____?____ stands; (increase)

(c) assessing _______ ha of low-site stands for proper classification; or

(d) improve the site productivity of low-site stands by _________ (fertilization?). (increase/maintain)

LT 3: Increase regenerated stand volumes by, in addition to those practices in MT 2:

(a) managing stocking so voids do not account for more than 10% of the area (increase); and

(b) repeat fertilize _____ ha/yr on a 15 yr return cycle (increase).

LT 4: Reduce losses to root rot by: (increase)

(a) pushover logging/stumping _____ ha/yr;

(b) planting alternate/mixed species on ______ ha/yr; or

(c) pop-up spacing on _____ ha/yr.

LT 5:

LT 6:

LT 7:

## 8.2 Workshop Review of Potential Strategies

### *8.2.1 Introduction*

Potential strategies were reviewed in the workshop according to the response time frames of short, mid and long term time periods. Each response time frame is the period in which the anticipated result of a potential strategy is expected, not the period in which actions must necessarily commence.

Workshop discussions are documented in the following tables. The contents of each column are further described below.

| Column Number | Note |
|---|---|
| 1 | Strategy numbers correspond with the numbers recorded earlier in "Potential Silviculture Strategies," page 26. Items followed by an asterisk (*) were added during the district workshop. |
| 2 | Information is largely from the district workshop, combined with information presented earlier in this document. |
| 3 | Anticipated results are calculated using a variety of methods. |

At the end of each time period is a summary of the anticipated responses for all strategies proposed for the period. Normally a potential harvest forecast is prepared under this summary. However, this is presently awaiting TSR2 analysis results on which to base a forecast.

### *8.2.2 Short Term (1 - 20 years)*

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| ST 1 | 1. Fertilize all suitable stands scheduled for harvest in the 2nd decade. (increase) | 1. Although the recent harvesting level has been 2 800 ha/yr, the level indicated by TSR1 analysis (2 500 ha/yr) is used here for consistency with other calculations. Relevant factors for stand suitability for late rotation fertilization are: species, site productivity, age, and crown closure.<br>logging 2 500 ha/yr total<br>1 800 ha/yr even aged --- about 10% of this is suitable for late rotation fert = 180 ha/yr<br>700 ha/yr uneven-aged --- about 50% is suitable for late rotation fert. = 350<br>**total potential late rotation fertilization program 530**<br>Fertilization in uneven-aged stands would follow partial harvesting.<br>Target stands are Pl, Fdi M-sites. Dry-belt Fdi is not recommended. Must be commercially thinned or partially cut in advance of fertilization so there is room for tree crowns to expand and utilize the fertilizer.<br>There is a concern about being able to accurately identify stands for fertilization that will be harvested in 10-15 years. CT'ing or partially harvesting before fertilization would make planning a final harvest in 10-15 years more certain.<br>A single late-rotation fertilization is estimated to increase yields by 15 m3/ha. 530 ha/yr X 15 m3/ha = 8 000 m3/yr. Cost at $200/ha = $106,000/yr.<br>The allocation of the benefit to the short term is a matter of harvest flow policies and AAC determination. If the AAC remained the same, harvesting larger volumes/ha would result in fewer ha's being harvested (8 000 m3/yr ÷ 250 m3/ha = 32 fewer ha would require harvesting). This has a positive effect on green-up. | 1. Gain of 8,000 m3/yr, about 10-15 yrs after fertilization. |
| ST 2 | 2. Overcome adjacency limitations by increasing: | 2. | 2. |
| ST 2 | (a) partial harvesting; and | (a) Lots of partial harvesting occurring in the IDF zone to accommodate mule deer winter range and in the ICH zone to accommodate adjacency constraints. There are concerns about the residual stands:<br>• What do the residual stands look like?<br>• What is the inventory label? – NSR or the original label is retained?<br>There is a danger residual stand volumes are being overestimated in the inventory. A review of these areas is needed. Noted under "Summary of Information and Research Needs," page 65. | (a) Partial harvesting is currently taking place where necessary to manage for winter range. |

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| ST 2 | (b) commercial thinning. | (b) Commercial thinning is differentiated from partial harvesting in that CT has no regeneration implications. There is presently no commercial thinning taking place. However, the district is planning some timber sales for harvesting post material. The recently issued Paxton value-added licence may involve some commercial thinning. Better growth and yield information is needed for CT'd stands. Noted under "Summary of Information and Research Needs," page 65. The potential for CT to contribute to timber supply was not evaluated in the workshop but was noted as having potential to enhance timber availability where adjacency rules might otherwise constrain the harvest. The role of commercial thinning in enhancing timber availability when harvesting would otherwise be constrained should be investigated in the Type II strategy analysis. | (b)Some CT planned in the short term. Better growth & yield info req'd. |
| | **Short Term Harvest Forecast Summary** | Potential Strategy # Effect<br>**ST1** Late rotation fertilize 530 ha/yr 8 000 m3/yr<br>**ST2** Overcome adjacency constraints by increasing:<br>(a) increase partial harvesting; and Current practice<br>(b) commercial thinning. Some planned. No info on effect on harvest forecast available. | |
| | **Conclusion** | Of the potential strategies examined, only late rotation fertilization has the identified potential to increase harvested volumes in the short term - by 8 000 m3/yr starting in the 2nd decade. Harvest flow objectives will typically apply the "gain" to extending the current harvest level for a longer period of time rather than immediately increasing AAC. Even if not harvested under an increased AAC, increasing timber volume in the 2nd decade also improves overall timber availability. Commercial thinning has potential to enhance timber availability where adjacency rules might otherwise constrain the harvest.<br>No harvest forecast prepared. Normally TSR information is used as a basis for activity response estimates. However TSR1 information is too old and TSR2 results are not yet available. | |

### 8.2.3 *Mid Term (21 - 90 years)*

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| MT 1 | 1. Repeat fertilize all suitable existing stands scheduled | 1. This strategy overlaps with ST1, MT2 and LT3 and therefore in itself has no direct implications for silviculture activities over the next 5 years. In the early part of this time period, | 1. Initially 8,000 m3/yr, rising thereafter as more treat- |

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Conclusion / Anticipated Result</th></tr>
<tr><td></td><td>for harvest 20 to 90 years from now.</td><td>approximately the same area will be suited to late rotation fertilization as in the short term (i.e. 530 ha/yr). At about 40 years from now, more managed stands will be of an age suitable for late rotation fertilization and the potentially treatable area will increase. This area can be determined by future strategies as the appropriate time nears. By this time, some of these stands could be under a multiple fertilization regime, in which case the late rotation fertilization under this potential strategy would be the last fertilization of the series. The first fertilization in a repeat fertilization program is covered under strategy MT2 (a) or MT2 (b)(viii). Ultimately, should virtually all fertilizable stands become managed, the program level would rise by the end of the mid term period to the level indicated in strategy LT 3 (b).<br><br>Stands to be fertilized must have had density controlled. This is assumed to have occurred under the strategies MT2 (b-vi), MT3 (a), LT4 (e) and Q1.</td><td>able area comes available.</td></tr>
<tr><td>MT 2</td><td>2. Reduce green-up ages by 5 years in the IRM, VQO and Watershed zones ~~and by 10 years in the wildlife management zone~~ by:</td><td>2. Anticipate that TSR2 will show green-up to be a major issue. 35% of the THLB is currently managed under Interior Watershed Assessment Procedure (IWAP) rules for equivalent clearcut area (ECA). These rules are:
<table>
<tr><th>ht (m)</th><th></th><th>ECA % Contribution</th></tr>
<tr><td>< 3</td><td>=</td><td>100</td></tr>
<tr><td>3-5</td><td></td><td>75</td></tr>
<tr><td>5-7</td><td></td><td>50</td></tr>
<tr><td>7-9</td><td></td><td>25</td></tr>
<tr><td>9+</td><td></td><td>10</td></tr>
</table>
Partially harvested areas contribute to this formula on a pro-rata basis.<br><br>After all areas are factored, IWAP specifies the maximum proportion of clearcut area in a drainage is 30%. The district manager may determine a lower limit where appropriate.<br><br>The management emphasis zones will also change for TSR 2. The TSR2 zones will be as follows (TSR1 in brackets):
<table>
<tr><th>Zone</th><th>%THLB</th><th>Ht</th><th>Age</th><th>Max % below</th></tr>
<tr><td>IRM</td><td>90 (50)</td><td>3</td><td>15 (20)</td><td>25 (33)</td></tr>
<tr><td>Com W/S</td><td>10</td><td>9</td><td>34</td><td>30</td></tr>
</table>
<b>The objective of reducing time to green-up by 5 years results in a target of achieving 3 m hts on average across the TSA by age 10.</b><br><br><i>Note 1: Because a wildlife management zone will not be used in TSR2, this part of the initial proposed strategy was dropped.</i><br><br><i>Note 2: The activities listed under this strategy affect not only time until green-up but also stand yields at harvest and the minimum harvestable ages of stands. Lowering minimum harvestable ages was not a factor in TSR1 (see</i> Figure 5, <i>page 18), but might be in TSR2. Increasing stand yields is a potential long-term strategy (see</i></td><td></td></tr>
</table>

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| | | *LT 3). These responses are also tracked under this potential strategy.*<br>Note 3: *The initial potential strategy (see "Potential Silviculture Strategies," page 26) was substantially revised in the workshop. This necessitated re-numbering the activities.)* | |
| MT 2 | (a) for existing stands:<br>(i) fertilizing existing stands currently 1-2 m in ht;* and | (a)(i) This strategy was added during the workshop. The objective is to get existing young stands over 3 m as soon as possible. The 3 m ht has the largest impact in both adjacency and IWAP calculations. This strategy would be of greatest value were further modelling to identify an adjacency problem 10-20 years from now.<br>If even-aged harvesting over the past 10 years has been 1 800 ha/yr then maximum potential treatment area = 10 X 1 800 = 18 000 ha. Of this, about $2/3^{rd}$'s is estimated to be 1-2 m ht. = 12 000 na. If 75% of this is Pl/Fdi and $2/3^{rd}$'s of that is available the net treatable area can be calculated as:<br>12 000 X .75 (Pl/Fdi) = 9 000 X .66 ($2/3^{rd}$'s available) = 6 000 treatable ha.<br>This could be developed into a program of either **1 200 ha/yr for 5 yrs** or 2 000 ha/yr over 3 yrs.<br>Although there is confidence that fertilization will be effective, further research is needed to determine the best cultural practices and to accurately estimate the actual reduction in time until green-up . The need for trials is noted under "Summary of Information and Research Needs," page 65. Trials should also investigate the fertilizer impact on the other vegetation in the stand and whether density control is needed prior to fertilization at early ages. Estimate that 3 m green-up could be reached 1 yr earlier. (Pl does not respond well in ht increment, more of the response in radial increment.) | (a) (i) 3 m green-up achieved 1 year earlier on about 1/3 of the area currently below 3 m ht.<br>stand level<br>Vol gain – 2%<br>GU red'n – 1yrs<br>min age red'n - 2 yrs<br>TSA level ($2^{nd}$ decade)<br>Vol gain – ? %<br>GU red'n – 0.5yr<br>min age red'n - ? yrs<br>See "Summary" below. |
| MT 2 | (ii) spacing ____ ha/yr of pine stands subject to repression | (a)(ii) Spacing Pl stands subject to repression would speed up hydrologic recovery. There are about 2 000 ha of pre-87 Pl > 10 000 sph that are 10-20 yrs old. These should be treated soon before repression sets in and the opportunity is lost. **Treating over a 5 yr period requires a program of spacing 400 ha/yr.** | (a)(ii) Maintains base case assumptions. |

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| MT 2 | (b) for about to be regenerated stands:<br>(i) using improved seed; (increase) | (b)(i) 80% of even-aged managed areas are planted. In 1998 about 1/6<sup>th</sup> of all planted area was improved S but the volume gain is low, between 2 and 9.4%. Future gains by 2007 are estimated to be:<br>Species: Pl, S, Fdi, Lw, Pw<br>% gain: 12, 13.8, 0, 7, ?<br>No improved Fdi will be available but there is little planted in the TSA, with most of the IDF being under uneven-aged management.<br>Opportunity area is all planted area which = (1800/2500 (75% of area) X 80% planted) = 1 440 ha/yr = 60% of THLB. Assuming gains across all species trend towards 13%, LTHL can be expected to rise (60% THLB X 13% volume gain) = 8%.<br>Tree improvement could significantly reduce green-up (estimate by 2 yrs) & minimum harvest ages (estimate by 10 – 15 yrs) on 60% of the THLB. | (b)(i)<br>stand level<br>Vol gain – 13%<br>GU red'n – 2 yrs<br>min age red'n - 10-15 yrs<br>TSA level<br>Vol gain – 8%<br>GU red'n – 1 yr<br>min age red'n - 10 yrs<br>See "Summary" below. |
| MT 2 | (b)(ii) site preparing ___ additional hectares | (b)(ii) 10-20% of P&T area harvested annually is mounded, largely in the wetter sites in the ESSF & ICH zones. MoF does about 10% of areas because is generally operating on drier sites than P&T. **No additional opportunity** to increase site prep. | (b)(ii) No opportunity. |
| MT 2 | (b)(iii) using larger planting stock | (b)(iii) Normal stock in the past has been 313's. P&T now using more 415's, especially on site-prepared ground, to reach free-growing sooner. **Anticipate this will reach a max of about 300 ha/yr.**<br>Total opportunity area estimated at 1 800 annual even-aged harvest X 80% planted = 1 400 ha/yr. Species ratios are 40% Pl, 30% S and 30% Lw. However, workshop discussion indicates little opportunity to expand. Much of the ground has shallow soils that will not accommodate larger stock.<br>Larger stock (in combination with site prep) is estimated to reach green-up 2 years sooner. Based on a 100 year rotation, this also equates to a 2% gain in MAI. Minimum harvestable sizes would also be achieved 2 years earlier.<br>At the TSA level, planting larger stock on 300 ha/yr = 300/2500 = 12% of the THLB. | (b)(iii)<br>stand level<br>Vol gain – 2%<br>GU red'n – 2 yrs<br>min age red'n - 2 yrs<br>TSA level<br>Vol gain – 0.25%<br>GU red'n – 0.25yr<br>min age red'n - 0.25yrs<br>See "Summary" below. |
| MT 2 | (b)(iv) fertilizing at time of planting | (b)(iv) P&T is investigating adding fertilizer to container stock at the nursery. Have attempted a few trials but results are inconclusive. No opportunity. | (b)(iv) No opportunity. |
| MT 2 | (b)(v) brushing ____ ha/yr for growth enhancement (in addition to ___ ha/yr to ensure free growing | (b)(v) Brush is not much of a problem. P&T would like to work with the brush rather than against it. A little backlog brushing is needed. – see LT1(b) | (b)(v) No opportunity. |
| MT 2 | (b)(vi) spacing ____ ha/yr of pine stands subject to repression | (b)(vi) Not likely to be any repression levels in future regenerated stands. See MT2(a)(ii). | (b)(vi) Maintains base case assumptions. |
| MT 2 | (b)(vii) spacing ____ ha/yr of Douglas-fir stands subject | (b)(vii) Evidence from the Shawnigan plots is that spacing in Fd stands subject to seasonal moisture deficits can increase productivity. Spacing can either increase or decrease ar- | (b)(vii) No opportunity. |

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| | to seasonal moisture deficits/armillaria.* | millaria infection, depending on when and how it is done.<br>No opportunity. Most Fd stands are managed on an uneven-aged management regime and are not suited/do not require spacing. | |
| MT 2 | (b)(viii) fertilizing ____ ha/yr. | (b)(viii) Ideally, newly regenerated stands would be on a repeat fertilization management regime where normally the first fertilization would occur after juvenile spacing. See LT 3. For the objective of earlier green-up, however, stands might have to be fertilized earlier than would be the usual time. This is effectively **a continuation of the 1 200 ha/yr fertilization program identified under MT 2(a). – 1200 ha/yr.** | (b)(viii) See MT 2(a). |
| MT 2 | (b)(ix) planting rust-resistant white pine | (b)(ix) Blister rust resistant Pw stock is now available. About 20% of the TSA is suited to this species – mostly in the Burrell and Granby areas (ICHmw2, Msmci). Annual opportunity are estimated at 20% X 2 500 ha/yr annual harvest = **500 ha/yr**.<br>Pw usually forms about 15-25% of a stand and **can reach 3 m ht in 5 years**. Because green-up is based on the 100 tallest trees Pw could easily form all of the counted trees. Planting Pw has very high potential to reduce green-up.<br>Pw also has strong potential to lift the wood supply in the critical late transition period (decades 8-11). Pw planted now would be maturing right in this period, or even past maturity. Because of its value, early mortality would likely be harvestable through commercial thinning. Assuming it survives, it could lower the minimum harvest ages of stands by 15 years. Other than shifting the timing of harvests, it is uncertain how much Pw might contribute to increasing total stand volumes. For now, it is considered part of the stand and contributes to the increased volumes assumed under MT 2(b)(i), improved trees, but does not increase volumes beyond this through improved site occupancy or recovery of lost stand mortality through CT, both of which have potential to increase volumes further. Pw management opportunities and harvest forecast implications need further investigation - noted under "Summary of Information and Research Needs," page 65. MT 2(b)(i) indicated tree improvement could reduce min. harv. ages 10-15 yrs. On stands planted with improved Pw as well as other improved species, this effect will easily be 15 yrs.<br>TSA level effects are calculated based on factoring the stand level effects by 20%, the proportion of the TSA THLB suited to Pw. | (b)(ix)<br>stand level<br>Vol gain – ?%<br>GU red'n – 10 yrs<br>min age red'n - 15 yrs<br>TSA level<br>Vol gain – ?%<br>GU red'n – 3yr<br>min age red'n - 3yrs<br>See "Summary" below. |
| MT 2 | (b)(x) planting birch | (b)(x) Planting birch has potential in areas prone to root rot and in watersheds for achieving early green-up. Limited suitable area. | (b)(x) Minor opportunity. |

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Conclusion / Anticipated Result</th></tr>
<tr><td>MT 2</td><td>SUMMARY</td><td>The following summarizes the estimated effects of strategy MT2. Effects at the TSA level are prorated based on the opportunity area as a percentage of the TSA's THLB. Totals are estimated using best judgement with respect to potential overlapping effects.
<table>
<tr><th rowspan="2">Strategy</th><th colspan="2">Volume Gain (%)</th><th colspan="2">Green-up age red'n(yrs)</th><th colspan="2">Min Harv. Age red'n(yrs)</th></tr>
<tr><th>Stand</th><th>TSA</th><th>Stand</th><th>TSA</th><th>Stand</th><th>TSA</th></tr>
<tr><td>(a)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(i) fertilize</td><td>2</td><td>?</td><td>1</td><td>0.5</td><td>2</td><td>?</td></tr>
<tr><td>(ii) space repressed Pl</td><td></td><td></td><td colspan="4">maintains base case</td></tr>
<tr><td>(b)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(i) improved stock</td><td>13</td><td>8</td><td>2</td><td>1</td><td>10-15</td><td>10</td></tr>
<tr><td>(ii) incr. site prep</td><td></td><td></td><td colspan="4">no opportunity</td></tr>
<tr><td>(iii) large stock</td><td>2</td><td>0.25</td><td>2</td><td>0.25</td><td>2</td><td>0.25</td></tr>
<tr><td>(iv) fert at planting</td><td></td><td></td><td colspan="4">no opportunity</td></tr>
<tr><td>(v) brush for growth</td><td></td><td></td><td colspan="4">no opportunity</td></tr>
<tr><td>(vi) space repressed Pl</td><td></td><td></td><td colspan="4">not likely req'd in future</td></tr>
<tr><td>(vii) space Fdi</td><td></td><td></td><td colspan="4">no opportunity</td></tr>
<tr><td>(viii) fert 1-2 m stands</td><td>2</td><td>?</td><td>2</td><td>?</td><td>2</td><td>?</td></tr>
<tr><td>(ix) plant resistant Pw</td><td>?</td><td>?</td><td>10</td><td>3</td><td>15</td><td>3</td></tr>
<tr><td>(x) plant Birch</td><td></td><td></td><td colspan="4">minor opportunity</td></tr>
<tr><td>(b) Total</td><td>17+</td><td>8.25+</td><td>6-10</td><td>1.25-3</td><td>10-15</td><td>10+</td></tr>
</table>
See also LT3 for additional potential strategies relevant to potential volume gains.</td><td>A 5 yr reduction in green-up ages will be achievable on some stands. At the TSA level, however, the overall effect is probably between 1 & 3 years.</td></tr>
<tr><td>MT 3</td><td>3. Set up stands for future partial harvesting/ commercial thinning ~~(emphasis on decade 8-11 harvests)~~ by:</td><td>3. TSR 1 indicated timber supply in decades 8-11 is either heavily constrained or very low due to an age class gap in stands currently aged 21-40 years, or both. It is unknown if TSR2 forecasts will show the same sensitivity, particularly with respect to adjacency constraints. It is expected that there may be a need to commercially thin to overcome adjacency constraints. In the workshop, because TSR2 results are not yet available, the emphasis on decades 8-11 was determined not an issue. Also, TSR2 will not be using a wildlife management zone, so this reference was also deleted from the potential strategy.<br><br>Target stands are Pl and Fdi with good access, even terrain, and medium to good productivity.</td><td>3.</td></tr>
<tr><td>MT 3</td><td>3.(a) spacing ____ ha/yr of _____ to set up stocking appropriate to commercial thinning; and</td><td>(a) Workshop participants estimated about 1/3 of the areas harvested under even-aged management (600 ha) could be appropriate for commercial thinning (CT). **This requires a spacing program of 600 ha/yr** to set up stocking.<br><br>While spacing under this strategy is preparatory for CT, it can of itself have some volume implications. Table 1, page 50, shows that while spacing Pl, SI 21 from 5 000 sph down to 1 600 sph only marginally raises MAI on a culmination MAI basis (from 4.78 to 4.84), it substantially raises MAI (by 7%, from 4.48 to 4.81) at a target DBH of 25cm. At this technical rotation age, spaced stand MAI is close to culmination MAI. Depending on how min ages are set and used in TSR2, this may or may not have an influence on the har-</td><td>(a) Spacing is preparatory for CT. Spacing can raise MAI at technical rotation ages. Requires Type II analysis to properly determine effects.</td></tr>
</table>

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| | | vest forecast. For creating CT potential, generating merchantable tree sizes at the time of planned CT is the governing factor, not culmination MAI. An unspaced Pl stand having 5 000 sph will have diameters too small for early CT, inadequate vigour for later CT when diameters finally reach merch sizes, and will be too old and too dense to respond to fertilization. Furthermore, later CT is less likely to generate timber supply in the mid term period, where is it presumably needed more. | |
| MT 3 | 3. (b) repeat fertilizing ____ ha/yr. | (b) A repeat fertilization would start at 600 ha/yr – the area annually spaced. This would be a subset of LT3(b). While repeat fertilization would be ideal, a 2X fertilization regime would be the next best management regime. In a 2X regime, the first fertilization (600 ha/yr) would be 10 yrs before CT and the second (600 ha/yr) about 2-3 yrs following CT. This fertilization regime would be phased in starting 40-60 years from now at 600 ha/yr (10 – 15 yrs before the first CT), rising to 1 200 ha/yr to include a 2$^{nd}$ fertilization 2-3 years after the first commercial thinning takes place. Because this fertilization does not begin until 40 years from now, it does not show in the program table which covers only the next 10 year period.<br>Each fertilizer application would add about (600 ha/yr X 15 m3/ha=) 9 000 m3/yr to harvest levels. Presumably the CT would capture the first volume lift in the mid to late part of the mid term period, while the capture of the 2$^{nd}$ volume lift would depend on whether the final harvest occurs in the late mid term or long term period.<br>Based on the Pl spacing regime and data in row 4 of Table 1, page 50, (Pl, SI 21, spaced from 5000 sph to 1600 sph) volume at 25 cm technical rotation is 366 m3/ha. If pre-CT fert adds 15 m3/ha, stand volume is increased to 381 m3/ha. Row 4 indicates 20% of stand volume is in the DBH class 15 - 20 cm (actual range 12.5 – 22.5 cm). Fertilization may shift these diameters up slightly. If thinning from below removes these smaller stems, CT could potentially transfer (20% of 381 m3/ha =) 76 m3/ha X 600 ha/yr = 45 600 m3/yr from the long term into the mid term, or else make this volume available when it otherwise wouldn't be due to forest cover constraints up to IWAP limits.. This calculation is probably optimistic because it is based on more productive Pl. Typical candidate stands may be not as productive or are Fdi. | (b) This is a subset of LT3(b). Fertilization could directly add 9 000 m3/application. CT could potentially transfer 45 600 m3/yr from LT to MT, or else make this volume available when it otherwise wouldn't be due to FCCs up to IWAP limits. Requires further analysis post-TSR2. Creates flexibility in timber supply. |
| MT 4 | 4. Increase the area satisfying older forest biodiversity requirements in decades by achieving the desired stand characteristics by 130 years of age by:<br>(a) spacing ____ ha/yr; and<br>(b) repeat fertilizing ____ ha/yr. | 4. Old seral and mature plus old biodiversity requirements are significantly affecting the current availability of timber for harvesting. However, without the TSR2 analysis results it is not possible to determine in the longer term what the effects will be. The model is expected to satisfy these requirements from outside the THLB. Because of this, a sensitivity test is planned that will not age the outside stands. Otherwise, as stands are aged, it becomes easier for the model to satisfy older forest constraints. Workshop participants felt that there was insufficient information at this time on which to review the potential strategy. This should be revisited once TSR2 results are available – noted under "Summary of Information and Research Needs," page 65. | 4. Insufficient information. |

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Conclusion / Anticipated Result</th></tr>
<tr><td></td><td><b>Mid Term Harvest Forecast Summary</b></td><td>
<table>
<tr><th>Potential Strategy #</th><th>Effect</th></tr>
<tr><td><b>MT1</b> Late rotation/repeat fert existing spaced.</td><td>8 000 m3/yr. Rises over time. See MT2 (a), MT2 (b)(viii), LT3 (b).</td></tr>
<tr><td><b>MT2</b> Reduce green-up ages by 5 years in the IRM, VQO and Watershed zones by:</td><td></td></tr>
<tr><td>(a) for existing stands:</td><td></td></tr>
<tr><td>(i) fert 1200 ha/yr of 1-2 m ht stands/5 yrs.</td><td>Hrvst forecast implications not calculated.</td></tr>
<tr><td>(ii) space 2000 ha repressed Pl</td><td>Maintains base case.</td></tr>
<tr><td>(b) many practices in regenerated stands.</td><td>MT hrvst forecast implications of reduced green-up ages not calculated. In total, all practices are estimated to increase LTHL by 8%.</td></tr>
<tr><td><b>MT3</b> Set up stands for PH/CT by:</td><td></td></tr>
<tr><td>(a) spacing 600 ha/yr to set up for CT.</td><td>Hrvst forecast implications require Type II silv analysis after TSR2.</td></tr>
<tr><td>(b) repeat fertilizing 600-1200 ha/yr.</td><td>Subset of LT3(b). Adds 9 000 m3/application. Could add 9 000 m3 MT and 9 000 m3 long term. CT could potentially transfer 45 600 m3/yr from LT to MT, or else make this volume available when it otherwise wouldn't be due to FCCs, up to IWAP limits.</td></tr>
<tr><td><b>MT4</b> Increase area satisfying old forest req'mts</td><td>Revisit after TSR2.</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td><b>Conclusion</b></td><td>In the absence of TSR2 information, it is not possible to confidently know the need for certain potential strategies. For example, without TSR2 analysis or Type II silviculture analysis, the effect of reduced green-up ages on freeing up mid term timber supply cannot be determined. At this point, the greatest potential for increasing mid term timber supply is through fertilization and commercial thinning.<br><br>Late rotation fertilization of 530 ha/yr offers the potential to increase harvests in the early part of the mid term by about 8 000 m3/yr, rising to probably twice this amount in the later mid term as more stands become suitable for fertilization. CT during the last several decades of the MT could potentially transfer 45 600 m3/yr from LT to the MT, or else make this volume available when it otherwise wouldn't be due to FCCs, up to IWAP limits. Some of the CT volume that is brought forward from the long term in this manner could be replaced in the LT by a post-CT fertilization.</td><td></td></tr>
</table>

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| | | Because some of the late rotation fertilization area would be CT'd, the total combined effect (of late rot'n fert area not CT'd plus CT volumes) during the later part of the mid term may be somewhere in the neighbourhood of 50 000 m3/yr. Alternatively, an even-flow mid term harvest target can be roughly determined on the following basis. Assuming CT would occur in the last 2 decades of the MT, this would transfer (20 yr X 45 000 m3/yr =) 900 000 m3 into the MT. Dividing this by the 70 year span of the MT gives an even-flow amount of ≅ 13 000 m3/yr. Adding 8 000 m3/yr from late rotation fertilization results in a total potential of 21 000 m3/yr across the full mid term, about 3% of current AAC. **Total additional mid-term timber supply ≅ (21 000 m3/yr X 70 yr ≅) 1.5 million m3. CT may reduce long term timber supply by a corresponding amount.** | |

## 8.2.4 *Long Term (91+ years)*

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Conclusion / Anticipated Result</th></tr>
<tr><td>LT 1</td><td>1. Maintain the THLB by<br>(a) Planting approx. 300 ha of backlog NSR; (maintain) and<br>(b) maintaining approx.____ ha of existing backlog plantations. (maintain)</td><td>1. (a) Most of the backlog NSR has been treated or reclassified. The 300 remaining treatable ha requires the program shown below to achieve free growing.<br>(b) About 900 ha of previously reforested area requires brushing to ensure free growing is achieved. The program shown below is required.
<table>
<tr><th></th><th colspan="5">Area (ha)</th></tr>
<tr><th></th><th></th><th></th><th colspan="3">Brush</th></tr>
<tr><th>Year</th><th>Site Prep</th><th>Plant</th><th>New Plnt'n</th><th>Existing</th><th>Total</th></tr>
<tr><td>1</td><td>100</td><td>100</td><td>0</td><td>400</td><td>400</td></tr>
<tr><td>2</td><td></td><td>100</td><td>0</td><td>300</td><td>300</td></tr>
<tr><td>3</td><td></td><td>100</td><td>100</td><td>100</td><td>200</td></tr>
<tr><td>4</td><td></td><td></td><td>100</td><td>100</td><td>200</td></tr>
<tr><td>5</td><td></td><td></td><td>100</td><td>0</td><td>100</td></tr>
<tr><td>6-10</td><td></td><td></td><td>150</td><td></td><td>150</td></tr>
</table></td><td>1. (a) (b) Maintain base case LTHL.</td></tr>
<tr><td>LT 2</td><td>2. Increase the THLB by:<br>(a) converting /rehabilitating ___ ha/yr of deciduous</td><td>2. Due to time constraints, this potential strategy was not reviewed in the workshop. Post-workshop follow-up indicates there will probably be few opportunities given biodiversity, possible future use or management of these stands.</td><td>2. Summary. Little potential identified.</td></tr>
</table>

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Conclusion / Anticipated Result</th></tr>
<tr><td></td><td>stands; (increase)</td><td>
<table>
<tr><th></th><th>Area (ha)</th><th>%THLB</th><th>Treatable Area</th></tr>
<tr><td>(a)Decid</td><td>3 400</td><td>1.2</td><td>_______</td></tr>
<tr><td>(b)Non-merch</td><td>14 200</td><td>4.6</td><td>6 218*</td></tr>
<tr><td>(c)Low site</td><td>3 600</td><td>2</td><td>_______</td></tr>
</table>
*Source: district dense pine study.<br><br>(a) Decid. The condition of these stands is not known. Some stands may be harvestable, some may be suitable for conifer release, some may be best allocated to meeting wildlife habitat objectives, while others may be suited to continuous deciduous management. If harvesting does occur then they can be converted to conifers or managed for hardwoods. Awaiting TSR2 results to better define the extent of excluded deciduous area (noted under "Summary of Information and Research Needs," page 65).</td><td>(a) Awaiting TSR2 results to define extent of excluded area.</td></tr>
<tr><td>LT 2</td><td>(b) converting/rehabilitating non-merchantable ______________ stands; (increase)</td><td>(b) Non-merch. These stands are mostly Pl. There are two reasons for not treating them immediately: (1) some may be suitable now for post and rail sales, or may prove merchantable in the future, and (2) if old-growth constraints are at their limits, other stands of better species and productivity would have to be immediately set aside to replace them upon rehabilitation.</td><td>(b) No opportunity.</td></tr>
<tr><td>LT 2</td><td>(c) assessing _______ ha of low-site stands for proper classification; or</td><td>(c) Awaiting TSR2 results to better define the extent of excluded low-site area.</td><td></td></tr>
<tr><td>LT 2</td><td>(d) improve the site productivity of low-site stands by (fertilization?). (increase/maintain)</td><td>(d) Awaiting TSR2 results to better define the extent of excluded low-site area.</td><td></td></tr>
<tr><td>LT 3</td><td>3. Increase the volume of regenerated stands by 20% over those used at the base case by, in addition to those practices in MT 2:<br><br>(a)managing stocking so voids do not account for more than 10% of the area (increase); and</td><td>3. (a) TIPSY standard OAF1 factor for voids is 15%. Objective is to reduce this to 10%.<br><br>Three factors indicate an OAF1 of 15% is likely high.<br><br>1. Current free growing requirements will result in < 15% in voids, however the actual amount is unknown.<br><br>2. A relatively high proportion of the total land area of the Boundary TSA (54%) is within the THLB. This implies more gentle terrain, with stand voids being less likely.<br><br>3. A relatively small proportion of the TSA is subject to under-stocking due to brush problems. Otherwise the problem is one of overstocking. Again, stand voids are less likely under this condition.<br><br>There is a need for completion of surveys for voids to get a measure of the actual area in voids (noted under "Summary of Information and Research Needs," page 65). Voids can be desirable for wildlife habitat, so intensive void management may not be practicable on</td><td>3. (a) 5% gain possible. See "Summary" below.</td></tr>
</table>

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Conclusion / Anticipated Result</th></tr>
<tr><td></td><td></td><td>all areas.</td><td></td></tr>
<tr><td>LT 3</td><td>(b)repeat fertilize _____ ha/yr on a 15 yr return cycle (increase).</td><td>(b) On a long term steady state basis, 50% of the species (Fdi & Pl) on 50% of the site classes could be suitable for a multiple fertilization regime. About 90% of this is considered available for treatment. This equates to (.5 X .5 X .9 = ) 22.5% of the THLB or 67 000 ha. On a 10 yr return cycle, **this requires a program of (67 000/10 = ) 6 700 ha/yr**. Estimated cost at $200/ha = $1.3 million/yr.<br><br>Probably 4 applications would be required, with the first occurring after juvenile spacing. Each application is estimated to add 15 m3/ha of growth, so 4 applications yields an additional 60 m3/ha. This is a 25% volume gain on a base stand yield of 250 m3/ha.<br><br>Note 1: The program of 6 700 ha/yr would be reached over a period of about 60 years, as ultimately all suitable stands become managed. Over the next decade, the program would initially be at the level defined under strategies ST1 – 530 ha/yr MT2 (a) – 1200 ha/yr and MT3 (b) – 600 ha/yr, for a total of 2 330 ha/yr.<br><br>Note 2: Stands to be fertilized must have had density controlled. This is assumed to have occurred under the strategies MT3 (a), LT4 (e) and Q1.</td><td>3. (b) A 25% volume gain on 22.5% of the THLB = a 6% volume gain overall. See "Summary" below.</td></tr>
<tr><td>LT 3</td><td>3. Summary</td><td>The following summarizes the estimated effects of strategy LT3 and combines it with those from MT2 to get a total potential. Effects at the TSA level are prorated based on the opportunity area as a percentage of the TSA's THLB. Totals are estimated using best judgement with respect to potential overlapping effects.<br><br>
<table>
<tr><th>Strategy</th><th colspan="2">Volume Gain (%)</th><th colspan="2">Green-up age red'n(yrs)</th><th colspan="2">Min Harv. Age red'n(yrs)</th></tr>
<tr><th></th><th>Stand</th><th>TSA</th><th>Stand</th><th>TSA</th><th>Stand</th><th>TSA</th></tr>
<tr><td>From MT2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>(b) Total</td><td>17+</td><td>8.25+</td><td>6-10</td><td>1.25-3</td><td>10-15</td><td>10+</td></tr>
<tr><td>From LT3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>reduce voids</td><td>5</td><td>5</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>repeat fert. (LT3)</td><td>25</td><td>6</td><td colspan="2">already in MT2</td><td>10</td><td>2</td></tr>
<tr><td>total (b) + LT 3</td><td>47+</td><td>19+</td><td>6-10</td><td>1.25-3</td><td>20-25</td><td>12+</td></tr>
</table></td><td>3. Summary<br><br>20% appears marginally achievable. Better site index estimates would likely indicate it is achievable.</td></tr>
<tr><td>LT 4</td><td>4. Reduce losses to root rot by: (increase)</td><td>4. A 10% OAF2 factor will be applied across all species in TSR2. Exceptions are Lw 7% and Fd 12% (due to Lw resistance, and Fd susceptibility and predominance of partial harvesting in Fd).<br><br>Estimate 1 000 ha/yr of 2500 total area harvested is seriously infested with armillaria = 40% of THLB. Infection is worst in Pl and Fdi, but occurs across entire land base. If volume loss in heavily infected stands is 20%, then loss over entire THLB is (2 X .4 =) 8%. Given that a basic OAF2 of 5% is intended to be 2% for breakage and 3% for decay, then a 10% OAF2 equates to an 8% deduction for decay. Thus a 10% estimate appears reasonable. Any action to reduce root disease losses would therefore serve to increase timber supply above the TSR2 base case</td><td></td></tr>
</table>

| Number | Potential Strategy/Action | Discussion / Current Status | Conclusion / Anticipated Result |
|---|---|---|---|
| LT 4 | (a) pushover logging / stumping; | (a) P&T is currently doing 4-500 ha/yr of stumping on slopes < 30% as part of basic silviculture. This program is decreasing in favour of less costly and equally effective alternatives. | (a) Basic silviculture obligation. Being phased out. |
| LT 4 | (b) planting alternate species; | (b) Wherever possible Lw, Pw and Py is planted on sites prone to armillaria. Some birch planting on an experimental basis. | (b) Basic silviculture obligation. Current practice on all planted areas. |
| LT 4 | (c) pop-up spacing; | (c) This is not a desirable treatment. Small diameter spacing (see below) is felt to be equally effective at less cost. | (c) Not done. |
| LT 4 | (d) hyphaloma inoculation* | (d) This potential strategy was added during the workshop. Currently, inoculating with hyphaloma is considered experimental but early results are encouraging. | (d) Experimental |
| LT 4 | (e) small diameter spacing* | (e) This potential strategy was added during the workshop. Small diameter spacing is increasingly used in silviculture prescriptions as an alternative to stumping or pop-up spacing. Early results indicate it is equally effective, plus has the added benefit of stocking control. P&T anticipates this could apply to 500 ha/yr and SBFEP expects 300 ha/yr to be treated. Assuming this occurs only on even-aged management sites, from which 90% of harvest volume originates, equals 800/1800 X .9 = 40% of volume.<br>A potential variation to small diameter spacing is to partially cut or break and push over trees that are ½ the height of crop trees. | (e) Basic silviculture obligation. Current practice on area equating to 40% of volume. |
| LT 4 | (f) chemical spacing* | (f) This potential strategy was added during the workshop. Chemical spacing is experimental at this time. | (f) Experimental |
| LT 4 | SUMMARY | The FP Code requires silviculture prescriptions incorporate actions to deal with armillaria when it is present in a harvested stand. Alternatives are being actively pursued, but their overall success over time is unknown. The need for further study of root rot management noted under "Summary of Information and Research Needs," page 65. | 4. Summary<br>Basic silviculture obligation. Being actively pursued. Results unknown but could be expected to ultimately result in a reduced OAF2. |

| Number | Potential Strategy/Action | Discussion / Current Status | | Conclusion / Anticipated Result |
|---|---|---|---|---|
| | | Potential Strategy # | Effect | |
| | **Long Term Harvest Forecast Summary** | **LT1** Backlog NSR | Maintain base case LTHL | |
| | | **LT2** Increase the THLB | | |
| | | (a) convert decid | Need TSR2 info. | |
| | | (b) rehab non-merch Pl | No opportunity | |
| | | (c) assess L site classifications | Need TSR2 info. | |
| | | (d) fert L site stands | Need TSR2 info. | |
| | | **LT3** Incr. regenerated stand vol's 20% by: | | |
| | | in addition to MT2, | MT2 indicates pot'l to incr. LTHL by 8% | |
| | | (a) managing voids | 5% increase in LTHL appears likely | |
| | | (b) repeat fertilizing 6,700 ha/yr | 6% increase in LTHL. | |
| | | Summary: 20% appears marginally achievable. Better site index estimates would likely indicate it is achievable. | | |
| | | **LT4** Root rot | Basic silviculture obligation. Being actively pursued. Results unknown but could be expected to ultimately result in a reduced OAF2. | |
| | **Conclusion** | Backlog NSR treatment activities must continue to maintain the base case. A 20% LTHL gain can be expected with current tree improvement program plans plus a very large repeat fertilization program that would commence at a low level and increase gradually as more area becomes occupied by managed stands. Additional tree improvement and possible site index adjustments may increase this further. | | |

## 8.3 Potential Harvest Forecast

A potential harvest forecast is not available, pending TSR2 analysis results.

# 9. *Opportunities to Improve Timber Quality*

The effects of incremental silviculture on the future quality of the timber resource are not analyzed in the timber supply review. Information in this section is taken from the *Boundary TSA Interim Stand Level Stand Tending Strategy* (MoF, undated) or was gathered during the district workshop.

## 9.1 Product Objectives

The following are product objectives at the log level for the Boundary TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| Premium Log: | Douglas-fir, spruce Pl Lw | 35+ cm DBH, clear 3-5 m log. |
| | larch, spruce | 30+ cm DBH, straight, low taper, building log |
| | western redcedar | 25+ cm DBH, pole |
| | lodgepole pine | 30+ cm DBH; large log |
| | western white pine | 30+ cm DBH, tight knots, premium species. |
| Sawlog: | Douglas-fir, larch, ponderosa pine, redcedar | 30+ cm DBH. |
| | lodgepole pine, spruce, balsam, hemlock | 25+ cm DBH. |

## 9.2 Potential Strategies by Response Time Frame

The following strategies have potential to increase timber quality. These were reviewed in the district workshop. The response time frame is the period in which the anticipated result is expected, not the period in which actions must necessarily commence.

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result / Premium Log Forecast |
|---|---|---|---|
| Short Term (1 - 20 yrs) | None | Short term harvests will come from existing older stands which are not treatable to improve quality. | Quality profile of existing old growth will prevail. Assume this is equal to a recent coast-wide estimate of 15%. |
| Mid Term (21 - 90 yrs) | Q1. space 500 ha/yr to increase average stand $DBHg_{all}$ from ___ cm to ___ cm. | Current program is 500 ha/yr. There is a need to continue this program in existing and future stands. Normal regime is 5-7000 sph spaced to 1400-1600 sph. There is an opportunity to increase the treated area, but awaiting TSR2 results re future age class distribution problems.<br>See also: LT4(e) – spacing 800 ha/yr for root rot control; MT3(a) – spacing 600 ha/yr in preparation for PH/CT. | See large log analysis. |
| | Q2. 1st lift prune 100 ha/yr to 3.5 m, and 2nd lift prune 50 ha to 5.5 m. | Max historic program has been 90 ha/yr. Currently 412 ha have been 1st lift pruned and only 4 ha's have been 2-lift pruned.<br>Goal is a 10 cm radius of clear wood. This requires a minimum DBH of 30 cm, preferably 35 cm. Target species are Pl, Fdi, Lw and Pw (future).<br>An annual program of 100 ha/yr would equal (100/1800 ha/yr harvested =) 4% of THLB. If 3.5 m = 15% of tree vol, (.04 X .15 =) 0.6%/yr of future harvest volume will be clear logs resulting from pruning. To get 5% clear by volume would need to 1st lift prune 800 ha/yr. **Feeling is that a small program of 100 ha/yr 1st lift and 50 ha/yr 2nd lift is reasonable. 2nd lift on ½ of area would raise clear volume to about 0.8% of total. Should be tied to corresponding regimes of spacing to 800 sph and repeat fertilization.** | 0.6 – 0.8% clear log content across total annual harvest volume. |
| Long Term (91 + yrs) | As above. | As above. | As above. |

## 9.3 Large Premium Log Analysis

Two large log analyses are reported below, both based on an annual spacing program of 900 ha/yr. This is equal to spacing one-half the annual area harvested under an even-aged management system. Spacing regimes are based on an amalgamation of the district target post-spacing stand densities presented in Table 1 of the *Boundary TSA Interim Stand Level Stand Tending Strategy* (MoF, undated). The district post-spacing densities are based on a goal of maximizing MAI while maintaining piece size and minimizing harvest age. The purpose of the analysis in this report is to gain some insight into the future timber quality profile under two basic scenarios: first, managing stands to a target saw-log DBH; and second, managing to reduced minimum harvest ages. This analysis is to a lower resolution than that of the district stand level strategy and is not a replacement of it.

All tables were generated using TIPSY version 2.1e with standard OAF's, to a 12.5 cm utilization standard for Pl and 17.5 for all other species. (There is no published validation for this model and it is an even-aged single-species model.) Because TIPSY has no mechanism for ingrowth following planting, unspaced stands having a stocking level of 5 000+ sph were assumed to be naturally regenerated. Stands with a stocking level of ≤ 3 000 sph were assumed to be planted. The difference between the # sph actually planted and the # used in the table is assumed ingrowth (e.g.; 3 000 sph planted = 1 400 sph planted + 1 600 sph ingrowth).

The table immediately below summarizes the assumed distribution of species and area spaced. The current species mix is derived from TSR1 data. The total area used in calculations includes only even-aged stands which are assumed to be 1800 of 2 500 ha of annual harvest area. The large log tables do not include an estimate for the premium log content from harvests in uneven-aged stands. Fdi/Lw stands occupy approximately 40% of the THLB and therefore 1 000 of the 2 500 ha of annual harvest, but because uneven-aged management is assumed to be largely in Fdi stands, only 300 ha of Fdi/Lw stands are shown in the tables under even-aged management. The area spaced is an allocation of the 900 ha total made by the consultant in preparation for the workshop.

| Species | % of THLB | Annual Harvest Area based on % THLB | Area under uneven aged management | Area under even-aged management | Area spaced |
|---|---|---|---|---|---|
| Fdi/Lw | 40 | 1000 | 700 | 300 | 100 |
| Pl | 40 | 1000 | | 1000 | 700 |
| S/B/Other | 20 | 500 | | 500 | 100 |
| Total | 100 | 2500 | 700 | 1800 | 900 |

The site indices used are weighted averages from Martin (1999) and can be considered inclusive of an OGSI site index adjustment. They do not, however, incorporate gains from stand management activities proposed under the potential strategies to improve the quantity of future timber supply.

Table 1 to Table 3 illustrate the effects of spacing on achieving a technical rotation (sawlog targets of 25 cm DBH for Pl (Table 1), 30 cm for Lw/Fdi (Table 2), and 25 cm for S/B (Table 3)). For example, rows 3 & 4 of Table 1 show that by spacing a Pl stand from 5 000 sph to 1 600 sph, a 25 cm DBH avg diameter target can be reached 15 years earlier, at 76 years vs at 91 years for the unspaced stand. At the technical rotation of 25 cm DBH, the MAI of the spaced Pl stand is 7% higher than that of the unspaced stand (rises from 4.48 to 4.81), indicating that spacing would also increase the harvest level over time at this technical rotation.

Under the assumptions employed, even with spacing, Table 1 to Table 3 show that only (2.1 + 1.5 + 2.8 =) 6.4% of annual harvested volumes in the long term will be large premium logs (32.5+ cm DBH for all species, except Fdi/Lw which is 42.5 cm+ DBH). It is unknown what the premium log content will be from uneven-aged stands, but conservatively could be estimated to raise the premium log content to at least **7%**.

Table 4 to Table 6 show the effects of managing stands to younger harvest ages (Pl – 60 & 80, other species – 100). This would be representative of the harvest profile at about the time of transition from existing stands to managed stands, about 90-100 years from now, with minimum harvest ages reduced about 15 years below culmination for Pl, about 35 years for Fdi/Lw, and 10 years for S/B. Under this scenario the large premium log content falls to (0.7+0.0+1.5 =) **2.2%**. Again, it is unknown what the premium log content will be from uneven-aged stands, but conservatively could be estimated to raise the premium log content under this scenario to at least **2.5%**. Offsetting the lower premium log content associated with harvesting at younger ages, Table 4 shows that, at younger harvest ages, spacing significantly reduces the number of smaller trees in the stand and increases those in the middle size range, while still maintaining about the same overall stand volume. For example, spacing Pl from 5 000 sph to 1 600 sph (row 3 vs row 4) reduces the # stems/ha in the 15-20 cm class by over 250 and increases the # stems/ha in the 25-30 cm DBH class from 345 to 449 sph. Total stand volume at 1 600 sph is 2 m3 greater than at 5 000 sph. Average stand DBH increases by almost 3 cm, creating a merchantable stand, whereas the unspaced stand would likely not be merchantable at the target age. Two other factors are also significant. First, the MAI of the spaced stand at the target harvest age of 60 years is virtually the same as that of the culmination MAI of the unspaced stand at 67 years. Second, the number of stems per hectare below merchantability drops substantially from 238 in the unspaced stand to 60 in the spaced stand. While this alone is not likely to be cause for conducting a spacing, it nevertheless does have implications for harvesting costs, fire hazard, aesthetics, etc.

With regard to Fdi, Table 5 TIPSY results indicate that, at a target harvest age of 100, MAI and total merch volume increases slightly as stocking levels are reduced from 10 000 down to 900. At 700 sph, MAI decreases, indicating the site is not fully occupied. Diameter distributions, however, are significantly affected by stocking. An unspaced stand with 5 000 sph at establishment has 60% of its stems below the 17.5 cm merchantability limit, compared to a stand spaced to 900 sph, which has only 19% of stems below merchantability. Again, this has implications to harvesting costs, fire hazards, plantability, aesthetics, etc. and depending on the local situation may or may not be relevant to the decision to space. More relevant to log quality and harvesting costs is the shift in of the number of stems in the smallest merchantability group (20 -25 cm) into the mid-range group (30 - 40 cm). Spacing from 3 000 sph down to 900 sph, for example, reduces the number of stems and the % total volume in the smallest merchantable size grouping by about one-third. Unspaced, virtually half of the stand's volume is in the smallest diameter grouping, while, with spacing, this falls to about one-third of total volume. At the same time, the volume in the mid-sized grouping

(30 -40 cm) increases by about 30%. The foregoing responses increase with increasing pre-treatment density and decrease with increasing post-treatment density.

For spruce, Table 6 indicates spacing again significantly reduces the number of stems in the non-merch and small-merch diameter groups, but, differently from Pl and Fdi, also significantly shifts volume into the large-diameter group. The data in this table do not show a direct spacing regime from 5 000 sph to 900 sph but comparing data from two of the regimes shown indicates large log volume could increase from 16% of total volume of unspaced (5 000 sph) stands to 47% spaced (to 900 sph). The spaced stand is also likely to have more total volume.

See also the discussion under workshop topic MT3 (a) on page 36 regarding the need for spacing related to preparing stands for fertilization and/or commercial thinning.

## Table 1. Large log analysis – Pl target harvest diameter of 25 cm

**Lodgepole pine: Target - 25.0 cm DBHg, 12.5 cm DBH utilization**

| Row # | Species | %rw | SI[2] | Regime Area spaced | Regime Area not space | Space frm/to | Reference Cul Age | Reference Cul Vol | Reference Cul MAI | Target DBHg -all (0.0+) | Harv Age | Harv Ht (m) | MAI | LRF $/m3 | Total Vol (12.5cm util) | Total Trees (0.0+) | Largest 250 Vol | Largest 250 DBHg | DBH class[1] 0 - 10 cm # trees | 0 - 10 cm % tot trees | 15 - 20 cm # trees | 15 - 20 cm tot trees | 15 - 20 cm vol | 15 - 20 cm tot vol | 25 - 30 cm # trees | 25 - 30 cm tot trees | 25 - 30 cm vol | 25 - 30 cm tot vol | 35+ cm # trees | 35+ cm tot trees | 35+ cm vol | 35+ cm tot vol | 5m large log[3] - % tot hrvst vol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pl | | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | comparison | | | | nat10000/unspaced | 91 | 403 | 4.43 | 25.0 | 101 | 27.2 | 4.19 | 249 | 423 | 861 | 227 | 32.9 | 22 | 3 | 325 | 38 | 81 | 19 | 427 | 50 | 244 | 58 | 88 | 10 | 98 | 23 | 0.0 |
| 3 | | comparison | | | | nat5000/unspaced | 67 | 320 | 4.78 | 25.0 | 91 | 28.2 | 4.48 | 245 | 407 | 907 | 207 | 32.8 | 15 | 2 | 364 | 40 | 82 | 20 | 446 | 49 | 243 | 60 | 82 | 9 | 82 | 20 | 0.0 |
| 4 | | | | 200 | | nat5000/1600 | 69 | 334 | 4.84 | 26.0 | 76 | 24.1 | 4.81 | 236 | 366 | 927 | 176 | 32.3 | 7 | 1 | 363 | 39 | 72 | 20 | 483 | 52 | 231 | 63 | 73 | 8 | 62 | 17 | 0.5 |
| 5 | | comparison | | | | nat5000/1400 | 71 | 334 | 4.71 | 25.0 | 70 | 23.1 | 4.70 | 231 | 329 | 882 | 165 | 32.3 | 15 | 2 | 337 | 38 | 63 | 19 | 449 | 51 | 202 | 61 | 70 | 8 | 64 | 19 | 0.0 |
| 6 | | comparison | | | | nat5000/1000 | 77 | 343 | 4.46 | 25.0 | 56 | 20.1 | 4.15 | 220 | 232 | 733 | 129 | 31.3 | 22 | 3 | 248 | 34 | 41 | 18 | 403 | 55 | 151 | 65 | 60 | 8 | 39 | 17 | 0.0 |
| 7 | | | | 300 | | plt2500/1400 | 63 | 303 | 4.89 | 26.0 | 72 | 23.9 | 4.82 | 227 | 347 | 906 | 172 | 32.2 | 7 | 1 | 366 | 39 | 69 | 20 | 460 | 51 | 208 | 60 | 84 | 9 | 70 | 20 | 0.8 |
| 8 | | comparison | | | | plt2500/900 | 68 | 312 | 4.59 | 25.0 | 50 | 19.4 | 4.22 | 213 | 211 | 694 | 117 | 30.5 | 14 | 2 | 217 | 31 | 35 | 17 | 420 | 61 | 149 | 71 | 45 | 6 | 27 | 13 | 0.0 |
| 9 | | | | | 150 | plt1600/unspaced | 66 | 314 | 4.75 | 26.0 | 83 | 25.3 | 4.54 | 229 | 377 | 968 | 182 | 32.4 | 5 | 1 | 373 | 39 | 73 | 19 | 512 | 53 | 239 | 63 | 70 | 7 | 66 | 17 | 0.4 |
| 10 | Pl | | 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | | comparison | | | | nat10000/unspaced | 101 | 258 | 2.55 | 24.6[4] | 250 | 26.9 | 1.52 | 247 | 381 | 821 | 220 | 32.6 | 29 | 4 | 330 | 40 | 79 | 21 | 386 | 47 | 219 | 57 | 75 | 9 | 83 | 22 | 0.0 |
| 12 | | | | 100 | | nat5000/1400 | 97 | 245 | 2.63 | 26.0 | 134 | 23.0 | 2.36 | 231 | 316 | 865 | 164 | 32.2 | 15 | 2 | 330 | 39 | 61 | 19 | 433 | 51 | 194 | 61 | 76 | 9 | 61 | 19 | 0.3 |
| 13 | | comparison | | | | nat5000/1000 | 100 | 234 | 2.34 | 25.0 | 97 | 20.1 | 2.34 | 220 | 227 | 718 | 128 | 31.3 | 22 | 3 | 244 | 34 | 41 | 18 | 394 | 55 | 148 | 65 | 58 | 8 | 38 | 17 | 0.0 |
| 14 | | | | 100 | | plt2500/1400 | 93 | 246 | 2.65 | 25.0 | 147 | 23.9 | 2.26 | 227 | 333 | 872 | 171 | 32.1 | 8 | 1 | 343 | 39 | 67 | 20 | 441 | 51 | 200 | 60 | 79 | 9 | 66 | 20 | 0.3 |
| 15 | | comparison | | | | plt2500/900 | 93 | 224 | 2.41 | 25.0 | 86 | 19.3 | 2.37 | 212 | 204 | 581 | 115 | 30.3 | 14 | 2 | 218 | 32 | 35 | 17 | 409 | 60 | 143 | 70 | 40 | 6 | 24 | 12 | 0.0 |
| 16 | | | | | 150 | plt1600/unspaced | 96 | 247 | 2.60 | 25.0 | 182 | 25.3 | 1.96 | 229 | 356 | 908 | 182 | 32.4 | 4 | 0 | 364 | 39 | 69 | 19 | 484 | 53 | 226 | 63 | 66 | 7 | 61 | 17 | 0.4 |
| 17 | Subtot | 40 | | 700 | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2.1 |

[1] Actual ranges are 0 - 12.5 cm, 12.6 - 22.5 cm, 22.6 - 32.5, and 32.6 + cm

[2] From Martin. 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, not a % of stand volume

[4] Exceeds TIPSY data: maxs out at DBHg =24.6 at age 250

# Table 2. Large log analysis – Lw/Fdi target harvest diameter of 30 cm

**Larch / Douglas-fir : Target - 30.0 cm DBHg, 17.5 cm DBH utilization**

| Row # | Species | %inv | SI[2] | Regime Area |  | Space frm/to | Reference |  |  | Target | Harv | Harv | MAI | LRF | Total |  | Largest 250 |  | DBH class[1] |  |  |  |  |  |  |  |  |  |  |  |  |  | 5m large log[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 - 15 cm |  | 20 - 25 cm |  |  |  | 30 - 40 cm |  |  |  | 45+ cm |  |  |  |  |
|  |  |  |  | spaced | not space |  | Cul Age | Cul Vol | Cul MAI | DBHg -all (0.0+) | Age | Ht (m) |  | bf/m3 | Vol (17.5cm util) | Trees (0.0+) | Vol | DBHg | # trees | % tot trees | # trees | tot trees | vol | tot vol | # trees | tot trees | vol | tot vol | # trees | tot trees | vol | tot vol | % tot hrvst vol |
| 1 | **Fd[4]** |  | **18** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | comparison |  |  |  |  | nat5000/unspaced | 136 | 374 | 2.75 | 29.7[5] | 239 | 37.2 | 2.25 | 270 | 538 | 742 | 470 | 44.8 | 212 | 29 | 211 | 28 | 69 | 13 | 209 | 29 | 232 | 43 | 108 | 15 | 238 | 44 | 0.0 |
| 3 |  |  |  |  | **100** | **nat3000/unspaced** | **136** | **376** | **2.78** | **30.0** | **210** | **36.8** | **2.44** | **261** | **513** | **718** | **426** | **43.5** | **180** | **25** | **213** | **30** | **69** | **13** | **236** | **33** | **262** | **51** | **89** | **12** | **183** | **36** | **0.5** |
| 4 |  |  |  | **50** |  | **nat3000/1400** | **136** | **374** | **2.77** | 30.0 | **177** | **33.7** | **2.62** | **267** | **464** | **684** | **374** | **42.0** | **144** | **21** | **208** | **30** | **64** | **14** | **268** | **38** | **262** | **56** | **73** | **11** | **138** | **30** | **0.2** |
| 5 | comparison |  |  |  |  | nat3000/900 | 138 | 376 | 2.72 | 30.0 | 135 | 30.1 | 2.72 | 251 | 367 | 588 | 288 | 38.9 | 91 | 15 | 170 | 29 | 53 | 14 | 294 | 50 | 257 | 70 | 34 | 6 | 57 | 16 | 0.0 |
| 6 |  |  |  |  | **100** | **plt2000/unspaced** | **133** | **372** | **2.79** | **30.0** | **223** | **36.6** | **2.36** | **263** | **627** | **731** | **455** | **44.4** | **189** | **26** | **222** | **30** | **67** | **13** | **216** | **29** | **234** | **44** | **104** | **14** | **226** | **43** | **0.6** |
| 7 |  |  |  | **50** |  | **plt2000/1200** | **132** | **375** | **2.84** | **30.0** | **173** | **33.6** | **2.69** | **258** | **465** | **686** | **379** | **42.2** | **147** | **21** | **207** | **30** | **64** | **14** | **253** | **37** | **254** | **55** | **77** | **11** | **148** | **32** | **0.2** |
| 8 | comparison |  |  |  |  | plt2000/900 | 132 | 378 | 2.87 | 30.0 | 139 | 30.8 | 2.86 | 252 | 397 | 617 | 309 | 39.5 | 97 | 16 | 192 | 31 | 62 | 16 | 285 | 46 | 263 | 68 | 42 | 7 | 72 | 18 | 0.0 |
| 8 | comparison |  |  |  |  | plt2000/700 | 134 | 374 | 2.79 | 30.0 | 115 | 28.1 | 2.73 | 246 | 314 | 516 | 250 | 37.3 | 54 | 10 | 162 | 31 | 53 | 17 | 279 | 54 | 229 | 73 | 20 | 4 | 31 | 10 | 0.0 |
| 9 | comparison |  |  |  |  | plt1600/unspaced | 133 | 371 | 2.79 | 30.0 | 211 | 36.0 | 2.44 | 264 | 515 | 731 | 442 | 44.2 | 180 | 25 | 236 | 32 | 72 | 14 | 214 | 29 | 230 | 45 | 102 | 14 | 213 | 41 | 0.0 |
| 10 | comparison |  |  |  |  | plt1200/unspaced | 132 | 373 | 2.83 | 30.0 | 177 | 33.9 | 2.65 | 258 | 469 | 699 | 382 | 42.5 | 133 | 19 | 238 | 34 | 70 | 15 | 248 | 35 | 244 | 52 | 81 | 12 | 154 | 33 | 0.0 |
| 11 | **Subtot.** | **20** |  | **100** | **200** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **1.6** |

[1] Actual ranges are 0 - 17.5 cm, 17.6 - 32.5 cm, 32.6 - 42.5, and 42.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

[4] TIPSY does not contain data for Larch. Fdi is the recommended substitute

[5] TIPSY data base limits reached at 29.7 cm DBH at 239 years

## Table 3. Large log analysis – S/B target harvest diameter of 25 cm

**Spruce / Balsam / Other : Target - 25.0 cm DBHg, 17.5 cm DBH utilization**

| Row # | Species | %inv | SI[2] | Regime Area | | Space frm/to | Reference | | | Target | Harv | Harv | MAI | LRF | Total | | Largest 250 | | DBH class[1] | | | | | | | | | | | | | | | 5m large log [3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | 0 - 10 cm | | 15 - 20 cm | | | | 25 - 30 cm | | | | 35+ cm | | | | |
| | | | | spaced | not space | | Cul Age | Cul Vol | Cul MAI | DBHg -all (0.0+) | Age | Ht (m) | | bf/m3 | Vol (17.5cm util) | Trees (0.0+) | Vol | DBHg | # trees | % tot trees | # trees | tot trees | vol | tot vol | # trees | tot trees | vol | tot vol | # trees | tot trees | vol | tot vol | % tot hrvst vol |
| 1 | **Sw**[4] | | **16** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | comparison | | | | | nat5000/unspaced | 122 | 388 | 3.18 | 27.5 | 147 | 29.9 | 3.02 | 256 | 444 | 779 | 278 | 36.9 | 21 | 3 | 235 | 30 | 57 | 13 | 350 | 45 | 197 | 44 | 173 | 22 | 200 | 45 | 0.0 |
| 3 | | | | | **400** | **plt2300/unspaced** | **108** | **370** | **3.43** | **27.5** | **140** | **29.9** | **3.12** | **242** | **437** | **801** | **263** | **36.5** | **1** | **0** | **245** | **31** | **67** | **13** | **395** | **49** | **211** | **48** | **169** | **20** | **179** | **41** | **2.3** |
| 4 | | | | **100** | | **plt2300/1545**[5] | **108** | **386** | **3.67** | 27.5 | **128** | **28.6** | **3.39** | **241** | **434** | **833** | **251** | **36.6** | **4** | **0** | **248** | **30** | **54** | **12** | **417** | **50** | **212** | **49** | **166** | **20** | **176** | **41** | **0.6** |
| 8 | comparison | | | | | plt2000/900 | 108 | 370 | 3.42 | 27.5 | 92 | 23.3 | 3.21 | 234 | 295 | 693 | 188 | 35.1 | 10 | 1 | 200 | 29 | 36 | 12 | 343 | 49 | 149 | 51 | 139 | 20 | 116 | 39 | 0.0 |
| 10 | comparison | | | | | plt1200/unspaced | 108 | 375 | 3.47 | 27.5 | 114 | 26.9 | 3.45 | 241 | 394 | 833 | 226 | 36.4 | 6 | 1 | 246 | 30 | 49 | 12 | 409 | 49 | 190 | 48 | 173 | 21 | 162 | 41 | 0.0 |
| 11 | **Subtot** | **20** | | **100** | **400** | | | | | | | | | | | | | | | | | | | | | | | | | | | | **2.8** |

[1] Actual ranges are 0 - 12.5 cm, 12.6 - 22.5 cm, 22.6 - 32.5, and 32.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

[4] TIPSY does not contain data for Balsam. Sw is the recommended substitute

[5] TIPSY data base limits reached at spacing to 1545 (district regime is to 1600)

## Table 4. Large log analysis – Pl target harvest ages 60 & 80

**Lodgepole pine: Target - Harvest Age 60 for SI 21 & Age 80 for SI 15, 12.5 cm DBH utilization**

| Row # | Species | %inv | SI[2] | Regime Area spaced | Regime Area not space | Space frm/to | Reference Cul Age | Reference Cul Vol | Reference Cul MAI | DBHg -all (0.0+) | Target Harv Age | Harv Ht (m) | MAI | LRF bf/m3 | Total Vol (12.5cm util) | Total Trees (0.0+) | Largest 250 Vol | Largest 250 DBHg | DBH class[1] 0 - 10 cm # trees | 0 - 10 cm % tot trees | 15 - 20 cm # trees | 15 - 20 cm tot trees | 15 - 20 cm vol | 15 - 20 cm tot vol | 25 - 30 cm # trees | 25 - 30 cm tot trees | 25 - 30 cm vol | 25 - 30 cm tot vol | 35+ cm # trees | 35+ cm tot trees | 35+ cm vol | 35+ cm tot vol | 5m large log[3] - % tot hrvst vol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Pl** | | **21** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | comparison | | | | | nat10000/unspaced | 91 | 403 | 4.43 | 17.7 | 60 | 21.1 | 4.64 | 209 | 279 | 1656 | 119 | 27.0 | 469 | 28 | 897 | 54 | 151 | 54 | 282 | 17 | 121 | 43 | 8 | 0 | 6 | 2 | 0.0 |
| 3 | comparison | | | | | nat5000/unspaced | 67 | 320 | 4.78 | 19.4 | 60 | 21.1 | 4.72 | 211 | 283 | 1396 | 122 | 28.1 | 238 | 17 | 799 | 57 | 129 | 46 | 345 | 25 | 142 | 50 | 14 | 1 | 11 | 4 | 0.0 |
| 4 | | | | **200** | | **nat5000/1600** | **69** | **334** | **4.84** | **22.3** | 60 | **21.1** | **4.76** | **217** | **286** | **1064** | **128** | **29.6** | **60** | **6** | **532** | **50** | **89** | **31** | **449** | **42** | **178** | **62** | **25** | **2** | **18** | **6** | **0.2** |
| 5 | comparison | | | | | nat5000/1400 | 71 | 334 | 4.71 | 23.3 | 60 | 21.1 | 4.60 | 219 | 276 | 950 | 133 | 30.4 | 45 | 5 | 429 | 45 | 72 | 26 | 433 | 46 | 172 | 62 | 44 | 5 | 31 | 11 | 0.0 |
| 6 | comparison | | | | | nat5000/1000 | 77 | 343 | 4.46 | 25.9 | 60 | 21.1 | 4.27 | 225 | 256 | 722 | 143 | 32.2 | 16 | 2 | 221 | 31 | 39 | 15 | 400 | 55 | 159 | 62 | 85 | 12 | 59 | 23 | 0.0 |
| 7 | | | | **300** | | **plt2500/1400** | **63** | **303** | **4.89** | **23.1** | 60 | **21.7** | **4.89** | **214** | **293** | **1002** | **138** | **30.3** | **38** | **4** | **485** | **48** | **84** | **29** | **433** | **43** | **177** | **60** | **45** | **4** | **33** | **11** | **0.5** |
| 8 | comparison | | | | | plt2500/900 | 68 | 312 | 4.59 | 27.0 | 60 | 21.7 | 4.53 | 225 | 272 | 681 | 153 | 32.8 | 8 | 1 | 159 | 23 | 29 | 11 | 416 | 61 | 173 | 64 | 99 | 15 | 70 | 26 | 0.0 |
| 9 | | | | | **150** | **plt1600/unspaced** | **66** | **314** | **4.75** | **22.0** | **60** | **21.3** | **4.73** | **207** | **284** | **1126** | **124** | **29.1** | **39** | **3** | **627** | **56** | **100** | **35** | **436** | **39** | **166** | **58** | **24** | **2** | **18** | **6** | **0.1** |
| 10 | **Pl** | | **15** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | comparison | | | | | nat10000/unspaced | 101 | 258 | 2.55 | 14.6 | 80 | 18.1 | 2.41 | 187 | 192 | 2191 | 78 | 23.9 | 1013 | 46 | 1044 | 48 | 146 | 76 | 134 | 6 | 46 | 24 | 0 | 0 | 0 | 0 | 0.0 |
| 12 | | | | **100** | | **nat5000/1400** | **97** | **246** | **2.53** | **20.7** | **80** | **18.1** | **2.36** | **198** | **189** | **1000** | **89** | **27.4** | **101** | **10** | **560** | **56** | **81** | **43** | **329** | **33** | **103** | **54** | **10** | **1** | **6** | **3** | **0.0** |
| 13 | comparison | | | | | nat5000/1000 | 100 | 234 | 2.34 | 23.1 | 80 | 18.1 | 2.15 | 205 | 172 | 738 | 96 | 29.0 | 37 | 5 | 317 | 43 | 47 | 27 | 366 | 50 | 115 | 67 | 18 | 2 | 10 | 6 | 0.0 |
| 14 | | | | **100** | | **plt2500/1400** | **93** | **246** | **2.65** | **20.7** | **80** | **18.5** | **2.55** | **193** | **204** | **1049** | **92** | **27.2** | **80** | 8 | **644** | **61** | **96** | **47** | **316** | **30** | **103** | **50** | **8** | **1** | **5** | **2** | **0.0** |
| 15 | comparison | | | | | plt2500/900 | 93 | 224 | 2.41 | 24.4 | 80 | 18.5 | 2.29 | 205 | 184 | 685 | 103 | 29.5 | 15 | 2 | 248 | 36 | 39 | 21 | 398 | 58 | 130 | 71 | 24 | 4 | 14 | 8 | 0.0 |
| 16 | | | | | **150** | **plt1600/unspaced** | **95** | **247** | **2.60** | **20.0** | **80** | **18.3** | **2.46** | **184** | **197** | **1145** | **83** | **26.2** | **66** | **6** | **798** | **70** | **111** | **56** | **276** | **24** | **84** | **43** | **5** | **0** | **3** | **2** | **0.0** |
| 17 | **Subtot.** | **40** | | **700** | **300** | | | | | | | | | | | | | | | | | | | | | | | | | | | | **0.7** |

[1] Actual ranges are 0 - 12.5 cm, 12.6 - 22.5 cm, 22.6 - 32.5, and 32.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, not a % of stand volume

[4] Exceeds TIPSY data: max's out at DBHg =24.6 at age 250

## Table 5. Large log analysis – Lw/Fdi target harvest age 100

**Larch / Douglas-fir : Target - Harvest Age 100, 17.5 cm DBH utilization**

| Row # | Species | %inv | SI[2] | Regime Area spaced | Regime Area not space | Space frm/to | Reference Cul Age | Reference Cul Vol | Reference Cul MAI | DBHg -all (0.0+) | Target Harv Age | Harv Ht (m) | MAI | LRF bf/m3 | Total Vol (17.5cm util) | Total Trees (0.0+) | Largest 250 Vol | Largest 250 DBHg | DBH class[1] 0 – 15 cm # trees | 0 – 15 cm % tot trees | 20 - 25 cm # trees | 20 - 25 cm tot trees | 20 - 25 cm vol | 20 - 25 cm tot vol | 30 - 40 cm # trees | 30 - 40 cm tot trees | 30 - 40 cm vol | 30 - 40 cm tot vol | 45+ cm # trees | 45+ cm tot trees | 45+ cm vol | 45+ cm tot vol | 5m large log[3] % tot hrvst vol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Fd[4]** | | **18** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | comparison | | | | | nat5000/unspaced | 136 | 374 | 2.75 | 18.6 | 100 | 25.6 | 2.56 | 223 | 256 | 1429 | 170 | 30.8 | 851 | 60 | 403 | 28 | 131 | 51 | 174 | 12 | 123 | 48 | 1 | 0 | 1 | 0 | 0.0 |
| 3 | | | | | 100 | **nat3000/unspaced** | **135** | **376** | **2.78** | **20.3** | **100** | **25.6** | **2.59** | **217** | **259** | **1154** | **171** | **31.3** | **572** | **50** | **393** | **34** | **126** | **49** | **188** | **16** | **132** | **51** | **1** | **0** | **1** | **0** | **0.0** |
| 4 | | | | 50 | | **nat3000/1400** | **136** | **374** | **2.77** | 22.8 | **100** | **25.6** | **2.60** | **222** | **260** | **870** | **177** | **32.1** | **306** | **36** | **351** | **40** | **110** | **42** | **212** | **24** | **147** | **57** | **2** | **0** | **2** | **1** | **0.0** |
| 5 | comparison | | | | | nat3000/900 | 138 | 376 | 2.72 | 25.9 | 100 | 25.6 | 2.53 | 231 | 253 | 625 | 184 | 33.2 | 121 | 19 | 261 | 42 | 84 | 33 | 240 | 38 | 165 | 65 | 4 | 1 | 5 | 2 | 0.0 |
| 6 | | | | | 100 | **plt2000/unspaced** | **133** | **372** | **2.79** | **20.6** | **100** | **26.0** | **2.64** | **217** | **264** | **1173** | **177** | **31.5** | **587** | **50** | **392** | **33** | **124** | **47** | **192** | **16** | **136** | **52** | **2** | **0** | **3** | **1** | **0.0** |
| 7 | | | | 50 | | **plt2000/1200** | **132** | **376** | **2.84** | **23.3** | **100** | **26.0** | **2.70** | **226** | **270** | **847** | **187** | **32.7** | **288** | **34** | **329** | **39** | **104** | **39** | **228** | **27** | **161** | **60** | **3** | **0** | **5** | **2** | **0.0** |
| 8 | comparison | | | | | plt2000/900 | 132 | 378 | 2.87 | 25.9 | 100 | 26.0 | 2.72 | 231 | 272 | 661 | 193 | 33.5 | 130 | 20 | 272 | 41 | 87 | 32 | 254 | 38 | 180 | 66 | 4 | 1 | 6 | 2 | 0.0 |
| 8 | comparison | | | | | plt2000/700 | 134 | 374 | 2.79 | 28.2 | 100 | 26.0 | 2.62 | 236 | 262 | 523 | 203 | 34.6 | 58 | 11 | 198 | 38 | 64 | 24 | 261 | 50 | 189 | 72 | 6 | 1 | 9 | 3 | 0.0 |
| 9 | comparison | | | | | plt1600/unspaced | 133 | 371 | 2.79 | 21.4 | 100 | 26.0 | 2.64 | 221 | 264 | 1052 | 180 | 31.8 | 463 | 44 | 390 | 37 | 120 | 45 | 196 | 19 | 138 | 52 | 4 | 0 | 6 | 2 | 0.0 |
| 10 | comparison | | | | | plt1200/unspaced | 132 | 373 | 2.83 | 23.6 | 100 | 26.0 | 2.69 | 224 | 269 | 826 | 183 | 32.5 | 235 | 28 | 372 | 45 | 113 | 42 | 216 | 26 | 151 | 56 | 2 | 0 | 3 | 1 | 0.0 |
| 11 | **Subtot.** | **20** | | **100** | **200** | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.0 |

[1] Actual ranges are 0 - 17.5 cm, 17.6 - 32.5 cm, 32.6 - 42.5, and 42.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, not a % of stand volume

[4] TIPSY does not contain data for Larch. Fdi is the recommended substitute

## Table 6. Large log analysis – S/B target harvest age 100

**Spruce / Balsam / Other : Target - Harvest Age 100, 17.5 cm DBH utilization**

| Row # | Species | %inv | SI[2] | Regime Area |  | Space frm/to | Reference |  |  | DBHq -all (0.0+) | Target Harv Age | Harv Ht (m) | MAI | LRF bf/m3 | Total |  | Largest 250 |  | DBH class[1] |  |  |  |  |  |  |  |  |  |  |  |  |  | 5m large log[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Cul Age | Cul Vol | Cul MAI |  |  |  |  |  | Vol (17.5cm util) | Trees (0.0+) | Vol | DBHq | 0 - 10 cm |  | 15 - 20 cm |  |  |  | 25 - 30 cm |  |  |  | 35+ cm |  |  |  |  |
|  |  |  |  | spaced | not space |  |  |  |  |  |  |  |  |  |  |  |  |  | # trees | % tot trees | # trees | tot trees | vol | tot vol | # trees | tot trees | vol | tot vol | # trees | tot trees | vol | tot vol | % tot hrvst vol |
| 1 | **Sw[4]** |  | **16** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | comparison |  |  |  |  | nat5000/unspaced | 122 | 388 | 3.18 | 20.8 | 100 | 23.5 | 2.92 | 220 | 292 | 1320 | 161 | 31.1 | 186 | 14 | 727 | 55 | 127 | 43 | 354 | 27 | 160 | 55 | 54 | 4 | 47 | 16 | 0.0 |
| 3 |  |  |  |  | **400** | **plt2300/unspaced** | **108** | **370** | **3.43** | **22.6** | **100** | **24.7** | **3.38** | **216** | **338** | **1208** | **179** | **32.3** | **64** | **5** | **669** | **56** | **115** | **34** | **408** | **34** | **187** | **56** | **79** | **7** | **70** | **21** | **1.2** |
| 4 |  |  |  | **100** |  | **plt2300/1545[5]** | **108** | **386** | **3.67** | 24.3 | **100** | **24.7** | **3.53** | **224** | **353** | **1036** | **188** | **33.5** | **29** | **3** | **471** | **46** | **87** | **25** | **434** | **42** | **196** | **56** | **101** | **10** | **91** | **26** | **0.4** |
| 8 | comparison |  |  |  |  | plt2000/900 | 108 | 370 | 3.42 | 28.6 | 100 | 24.7 | 3.36 | 239 | 336 | 681 | 216 | 36.8 | 7 | 1 | 170 | 25 | 32 | 10 | 327 | 48 | 150 | 45 | 178 | 26 | 159 | 47 | 0.0 |
| 10 | comparison |  |  |  |  | plt1200/unspaced | 108 | 375 | 3.47 | 26.1 | 100 | 24.7 | 3.41 | 233 | 341 | 874 | 192 | 34.6 | 13 | 1 | 315 | 36 | 59 | 17 | 424 | 49 | 186 | 55 | 122 | 14 | 106 | 31 | 0.0 |
| 11 | **Subtot.** | **20** |  | **100** | **400** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.5 |

[1] Actual ranges are 0 - 12.5 cm, 12.6 - 22.5 cm, 22.6 - 32.5, and 32.6 + cm

[2] From Martin, 1999 *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

[4] TIPSY does not contain data for Balsam. Sw is the recommended substitute

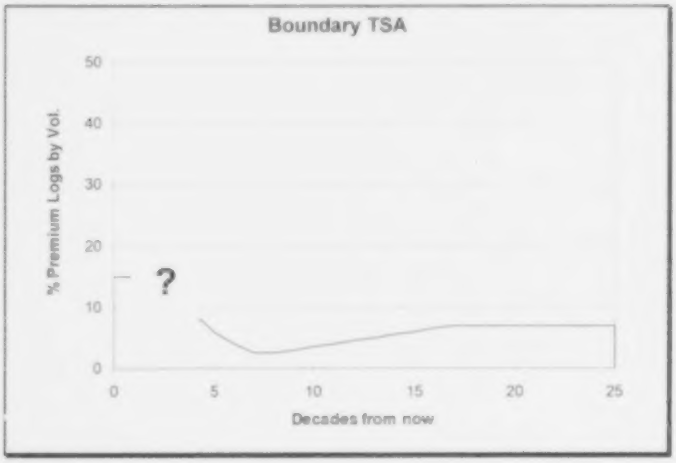
[5] TIPSY data base limits reached at spacing to 1545 (district regime is to 1600)

## 9.4 Timber Quality Forecast

The foregoing analysis indicates the premium log content of harvests in the mid and long term will be lower than today's levels. In the absence of more precise analysis, it is assumed that premium log content will fall to about 2.5% in the later mid term and recover to about 7% in the long term. Data for the current local percentage of harvest that is in premium logs is not available, but could readily be obtained from local sawmills. In the interim it is assumed to be about 15%, the figure used in the provincial interim strategy document (MoF, 1999).

Postponing harvest to ages that are past culmination age would increase the large dimension component of premium logs.

**Figure 14. Potential Quality Forecast, Boundary TSA**



This quality forecast is for large-premium logs. Best estimate is that large premium logs will likely form 2.5 - 7% of future harvest volumes.

Clear logs could form about 1% of future harvest volumes (based on 1st lift pruning 100 ha/yr & 2nd lift of 50 ha/yr). Most clear logs will also be large logs. Without pruning there will be no clear logs from the majority of the 2nd growth forests.

# 10. Incremental Silviculture Strategy

This section synthesizes the preceding background information, workshop discussion and subsequent analysis into a silviculture strategy for the TSA. Basic silviculture as required by the *Forest Practices Code of British Columbia Act* is assumed.

## 10.1 General Strategy

Because the TSR2 analysis is not yet available it is difficult to identify with any precision both the silvicultural opportunities and their relative importance. In its stead, the workshop participants relied on their own local knowledge of issues and opportunities as well as some expectation of what TSR2 may look like. While the TSR1 forecast suggests the existing harvest level can be maintained for many decades, in contrast forest companies are having difficulty finding available wood for harvest. The first objective of this strategy, therefore, is to undertake silvicultural actions that will enhance short term timber supply, both in terms of amount and availability. Workshop analysis indicates there is a potential for late rotation fertilization of some stands.

It is not possible to predict the shape of mid term timber supply in the absence of TSR2 information. A mid term objective, therefore, is to increase the quantity of the timber to be available for harvesting in this time period. Programs of spacing and fertilization can accomplish this.

In the long term, starting about 90 years from now, workshop analysis indicates silvicultural activities can result in at least 20% higher harvest levels. The baseline to which this is applied, however, must await TSR2 analysis. In the absence of this analysis, a long term objective is to maximize timber production within a context of sound multiple resource stewardship. Workshop analysis indicates that silvicultural activities can contribute significantly to this objective.

Based on a clear log definition of being able to produce 25% clear lumber by volume, 2nd growth managed stands will have no clear logs. A second long term objective is to create a long term timber supply yielding at least 1% clear logs on a total harvest volume basis.

Accomplishing these objectives requires an incremental silviculture program substantially above historic levels. Some changes in basic silviculture activities also present opportunities to contribute to the objectives.

## 10.2 Log Product Objectives

The following are product objectives at the log level for the Boundary TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| Premium Log: | Douglas-fir, spruce Pl Lw | 35+ cm DBH, clear 3-5 m log. |
| | larch, spruce | 30+ cm DBH, straight, low taper, building log |
| | western redcedar | 25+ cm DBH, pole |
| | lodgepole pine | 30+ cm DBH; large log |
| | western white pine | 30+ cm DBH, tight knots, premium species. |
| Sawlog: | Douglas-fir, larch, ponderosa pine, redcedar | 30+ cm DBH. |
| | lodgepole pine, spruce, balsam, hemlock | 25+ cm DBH. |

## 10.3 Silviculture Strategies

The following strategies have identified potential to maintain and/or increase the quantity and quality of the timber supply of the Boundary TSA. Strategy numbers correspond with those recorded earlier.

### *10.3.1 Strategies to Increase the Quantity of Future Timber Supply*

Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them.

These strategies are supported by specific silvicultural regimes listed on page 62 along with investment priorities.

| Number | Strategy | Priority* |
|---|---|---|
| | *B - denotes basic silviculture item, the cost of which would be borne by licensees. Most items are current practice | |
| Surveys | Conduct approximately 5 400 ha/yr of silviculture surveys in support of all strategies. | |

## SHORT TERM

**Objectives:**

- enhance short term timber supply, both in terms of availability and physical extent.

**Working Targets:**

- Maintain the current harvest level for at least 20 years.

**Strategies:**

| | | |
|---|---|---|
| **ST1** | Late rotation fertilize 530 ha/yr to produce approximately 8 000 m3/yr of additional harvest volume by the 2nd decade. | **5** |
| **ST2** | Commercially thin stands where needed to enhance timber availability when adjacency rules might otherwise constrain the harvest. | **As needed** |

## MID TERM

**Objectives:**

- Increase the quantity of timber to be available for harvesting.

**Working Targets:**

- Generate a potential additional 1.5 million m3 to mid-term timber supply.

**Strategies:**

| | | |
|---|---|---|
| **MT2** | Reduce green-up ages by 5 years in the IRM, VQO and Watershed zones, by: | |
| **(a)** | for existing stands: | |
| **(i)** | fertilizing 1 200 ha/yr of existing Pl/Fdi stands currently 1-2 m high; and | **B-3** |
| **(ii)** | spacing 2 000 ha of pre-87 repressed Pl stands that are currently 10-20 years old at the rate of 400 ha/yr (to speed up hydrologic recovery). | **2** |
| **(b)** | for about to be regenerated stands: | |
| **(i)** | using improved seed on all planted areas (1 440 ha/yr); | **B-1** |

| Number | | Strategy | Priority* |
|---|---|---|---|
| | | *B - denotes basic silviculture item, the cost of which would be borne by licensees. Most items are current practice | |
| | | **(iii)** using larger (415) planting stock on 300 ha/yr (current practice); | **B-2** |
| | | **(viii)** Continuing MT2(a)(i) - fertilization 1 200 ha/yr of Pl/Fdi; | **B-3** |
| | | **(ix)** include rust resistant white pine in plantations (500 ha/yr). | **B-1** |
| **MT3** | | Set up Pl and Fdi stands (target stands having good access, even terrain and M to G site) for future partial harvesting or commercial thinning, by: | |
| | **(a)** | spacing 600 ha/yr; and | 3 |
| | **(b)** | repeat fertilizing 600 ha/yr (subset of LT3 (b)). (Alternatively may be fertilized 10-15 yrs prior to PH/CT and 2-3 yrs after, which would have no implications for current programs.) | 5 |

## *LONG TERM*

**Objectives:**

- Maximize long term timber production within a context of sound multiple resource stewardship.
- Improve the quality of the timber to be harvested.

**Working Targets:**

- Increase long term timber supply by at least 20%.
- Generate at least 7% of total harvest volume in premium large logs (no current silviculture strategy implications).
- Generate at least 1% of total harvest volume in clear premium logs (clear logs will generally also be large logs).

**Strategies:**

| | | | |
|---|---|---|---|
| **LT1** | | Maintain the timber harvesting land base by: | |
| | **(a)** | Planting approximately 300 ha of backlog NSR. | 1 |
| | **(b)** | Maintaining approximately 900 ha of previously reforested backlog plantations. | 2 |
| **LT3** | | Increase the volume of regenerated stands by 20% over those used at the base case by, in addition to those practices in MT 2: | |
| | **(b)** | Repeat fertilizing 1 200 ha/yr (as per strategies MT2(a) and MT3 (b)), rising gradually over about 60 years to 6 700 ha/yr as more stands come under management, for an expected result of a 6% gain in LTHL. | 5 |

| Number | | Strategy | Priority* |
|---|---|---|---|
| | | *B - denotes basic silviculture item, the cost of which would be borne by licensees. Most items are current practice | |
| **LT4** | | Reduce losses to root rot by: | |
| | **(a)** | pushover logging/stumping 400 ha/yr on slopes < 30% (basic silviculture; being phased out in favour of small-diameter spacing); | **B-4** |
| | **(b)** | planting Lw, Pw and Py on 1 440 ha/yr (basic silviculture); | **B-2** |
| | **(c)** | pop-up spacing 10 ha/yr; and | **6** |
| | **(e)** | small diameter spacing 800 ha/yr (basic silviculture; being phased in as an alternative to stumping). | **B-4** |
| **Q1** | | Space 500 ha/yr of existing (and future) stands with 5-7 000 sph down to levels in accordance with the district stand level strategy to increase average stand diameters. | **3** |
| **Q2** | | First-lift prune 100 ha/yr and 2<sup>nd</sup> lift prune 50 ha/yr for a total pruning program of 150 ha/yr (target stands spaced to 800 sph and under repeat fertilization regime). | **4** |

### *10.3.2 Working Target Illustration*

A graphical representation of the potential harvest forecast is not available, pending TSR2 analysis results.

### *10.3.3 Strategies to Increase the* Quantity *or* Quality *of Future Habitat Supply*

The following strategy has identified potential to increase the quality or quantity of the habitat supply of the Boundary TSA.

| No. | Strategy | Priority |
|---|---|---|
| | No specific strategies proposed at this time. See "Silviculture Regimes and Investment Priorities," page 62 for implications of specific silvicultural activities for habitat. | |

# 11. Silviculture Regimes and Investment Priorities

The following table indicates silviculture regimes which are suitable to attaining the above working targets and strategies.

| Regimes | Strategy | Opportunity | Timber Supply Effects | | | | Habitat | Jobs | Cost | Workshop |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Area (Ha/Yr) | Short | Medium | Long | Quality | | Days/ha | $/ha[1] | Rank |
| **Survey** | | | | | | | | | | |
| 1 Surveys | | 5,400 | | | | | | 0.1 | 20 | 1 |
| **Backlog** | | | | | | | | | | |
| 2 NSR | L1 (a) | 100 | | + | + | | | 0.8 | 550 | 1 |
| 3 Brushing | L1 (b) | 400 | | | + | | +/- | 3.5 | 600 | 2 |
| **Pre FG** | | | | | | | | | | |
| 4 improved seed | M2(b)(i) | 1440 | | + | | | | 0 | 80 - B | B-1 |
| 5 larger planting stock | M2(b)(ii) | 300 | | + | | | | 0.5 | 153 - B | B-2 |
| 6 fertilize existing regen (accelerate greenup)[1] | M2(a-i)(b-viii) | 1200 | + | + | | | | 0.1 | 300 | B-3 |
| 7 plant Pw | M2(b)(ix) | 500 | | + | + | + | | 0 | B | B-1 |
| 8 space repressed Pl[2] | M2(a)(ii) | 400 | | + | + | + | + | 3.5 | 550 | 2 |
| 9 push-over /stumping | L4(a) | 400 | | | + | | - | 1 | B | B-4 |
| 10 plant alternative species(larch, Py, Pw, Ep) | L4(b) | 1440 | | | + | | + | 0 | B | B-2 |
| 11 small diameter spacing[2] | L4(e) | 800 | | + | + | | | 3.5 | 550 | B-4 |
| 12 pop-up spacing[2] | L4(c) | 10 | | + | + | | | 3.5 | 550 | 6 |
| **Post FG** | | | | | | | | | | |
| 13 spacing stands for future PH/CT[2] | M3 (a) | 600 | | + | + | + | + | 3.5 | 550 | 3 |
| 14 spacing stands for quality[2] | Q1 | 500 | | + | + | + | + | 3.5 | 550 | 3 |
| 15 Fertilize late rotation[1] | S1 | 530 | + | | | | + | 0.1 | 300 | 5 |
| 16 Fertilize (spaced (#13), planned for PH/CT)[1] | M3 (b) | 600 | | + | +/- | | + | | | 5 |
| 17 Prune (100 ha 1st lift, 50 ha 2nd lift) | Q2 | 150 | | | - | + | + | 6 | 965 | 4 |

Notes

[1] Total immediate fert = 2 330 ha/yr. Fert program could ultimately expand to a max. level of about 6700 ha/yr in about 60 years (see LT 3(b))

[2] Total spacing = 2 310 ha/yr, 800 of which is basic spacing for root rot control purposes. Total spacing will diminish over time as the spacing of existing Pl subject to repression is completed, and the basic spacing (800 ha - small diameter) ultimately reduces the area requiring later stocking control

B - denotes basic silviculture item, the cost of which would be borne by licensees. Most items are current practice

## 12. *Incremental Silviculture Program*

The following annualized program will contribute to achieving the above goals and strategies. This program is considerably above historic levels and some activities may require phasing in. Spacing and fertilization goals are totals of several strategies. Lesser program levels should be oriented to specific target stands in accordance with the ranking shown in the regime table.

**Incremental Silviculture Program Table - Ha, Boundary TSA July 21-22, 1999**

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| Year | Surveys* | Establish | Maintain | Space Repressed | | | | Total |
| 1 | 5,400 | 100 | 400 | 400 | 1,110 | 150 | 2,330 | 9,890 |
| 2 | 5,400 | 100 | 300 | 400 | 1,110 | 150 | 2,330 | 9,790 |
| 3 | 5,400 | 100 | 200 | 400 | 1,110 | 150 | 2,330 | 9,690 |
| 4 | 5,400 | | 200 | 400 | 1,110 | 150 | 2,330 | 9,590 |
| 5 | 5,400 | | 100 | 400 | 1,110 | 150 | 2,330 | 9,490 |
| Subtot Yr 1 - 5 | 27,000 | 300 | 1,200 | 2,000 | 5,550 | 750 | 11,650 | 48,450 |
| 6 - 10 | 27,000 | - | 150 | - | 5,550 | 750 | 11,650 | 45,100 |
| Total Yr 1 - 10 | 54,000 | 300 | 1,350 | 2,000 | 11,100 | 1,500 | 23,300 | 93,550 |

* Includes prescription and layout

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unit cost ($/ha) | 20 | 550 | 600 | 550 | 550 | 965 | 300 |

**Program Table - $ 000s, Boundary TSA July 21-22, 1999**

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| Year | Surveys* | Establish | Maintain | Space Repressed | | - | - | Total |
| 1 | 108 | 55 | 240 | 220 | 611 | 145 | 699 | 2,077 |
| 2 | 108 | 55 | 180 | 220 | 611 | 145 | 699 | 2,017 |
| 3 | 108 | 55 | 120 | 220 | 611 | 145 | 699 | 1,957 |
| 4 | 108 | - | 120 | 220 | 611 | 145 | 699 | 1,902 |
| 5 | 108 | - | 60 | 220 | 611 | 145 | 699 | 1,842 |
| Subtot Yr 1 - 5 | 540 | 165 | 720 | 1,100 | 3,053 | 724 | 3,495 | 9,796 |
| 6 - 10 | 540 | - | 90 | - | 3,053 | 724 | 3,495 | 7,901 |
| Total Yr 1 - 10 | 1,080 | 165 | 810 | 1,100 | 6,105 | 1,448 | 6,990 | 17,698 |

* Includes prescription and layout

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes

# 13. Job Outcomes

The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets.

**Program Job Outcomes, Boundary TSA July 21-22, 1999**

***Short term*** *employment associated with undertaking the silviculture activity, in person years*

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| Year | Surveys* | Establish | Maintain | Space Repressed | - | - | - | Total |
| 1 | 2.7 | 0.4 | 7.0 | 7.0 | 19.4 | 4.5 | 1.2 | 42.2 |
| 2 | 2.7 | 0.4 | 5.3 | 7.0 | 19.4 | 4.5 | 1.2 | 40.4 |
| 3 | 2.7 | 0.4 | 3.5 | 7.0 | 19.4 | 4.5 | 1.2 | 38.7 |
| 4 | 2.7 | - | 3.5 | 7.0 | 19.4 | 4.5 | 1.2 | 38.3 |
| 5 | 2.7 | - | 1.8 | 7.0 | 19.4 | 4.5 | 1.2 | 36.5 |
| Subtot Yr 1 - 5 | 13.5 | 1.2 | 21.0 | 35.0 | 97.1 | 22.5 | 5.8 | 196.2 |
| 6 - 10 | 13.5 | - | 2.6 | - | 97.1 | 22.5 | 5.8 | 141.6 |
| Total Yr 1 - 10 | 27.0 | 1.2 | 23.6 | 35.0 | 194.3 | 45.0 | 11.7 | 337.7 |

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes.

# 14. Summary of Information and Research Needs

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for an incremental silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 29.

1. Compare the actual post-harvesting stands in older partially harvested areas with inventory labels to (a) ensure the label correctly reflects the stocking of residual stands; and (b) determine how the residual stands are performing and if there is a need for silvicultural actions. (ST2 (a))
2. Better growth and yield information is needed for commercially thinned stands. The role of commercial thinning in enhancing timber availability when harvesting would otherwise be constrained should be investigated in the Type II strategy analysis. (ST2 (b))
3. Trials are needed to determine the effects on time until green-up of fertilizing stands 1-2 m tall. Trials should also investigate the fertilizer impact on the other vegetation in the stand and whether density control is needed prior to fertilization at early ages. (MT2 (a))
4. Pw management opportunities and harvest forecast implications need further investigation. (MT2 (b) (ix))
5. Following release of TSR2 analysis report, review the TSA sensitivity to a reduction in the age requirement for older forests. If the TSA is sensitive to this, revisit potential strategy MT4. (MT4)
6. Following release of TSR2 analysis report, review the extent of excluded deciduous areas to determine their potential and suitable silviculture treatments, if any. (LT2 (a))
7. OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (LT3 (a))
8. Further study of root rot management techniques and resultant OAF2 impact is needed. (LT4 - Summary)

# 15. References

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# 16. Abbreviations

The following abbreviations may be used.

| | |
|---|---|
| AAC | allowable annual cut |
| CF | chief forester |
| CT | commercial thinning |
| DBH | diameter at breast height |
| ESSF | engelmann spruce - subalpine fir (ecological zone) |
| FCC | forest cover constraints |
| FG | free growing |
| FRBC | Forest Renewal BC |
| ICH | interior cedar-hemlock (ecological zone) |
| IHL | initial harvest level |
| IRM | integrated resource management |
| KBLUP | Kootenay-Boundary Land Use Plan |
| LT | long term |
| LTHL | long term harvest level |
| LRSY | long run sustained yield |
| MoELP | Ministry of Environment, Lands and Parks |
| MoF | Ministry of Forests |
| MS | montane spruce (ecological zone) |
| MT | mid term |
| NCBr | non-commercial brush |
| NSR | not satisfactorily restocked |
| OAF | operational adjustment factor |
| OLB | operable land base |
| SBFEP | small business forest enterprise program |
| SI | site index |
| ST | short term |
| TFL | tree farm licence |
| THLB | timber harvesting land base |
| TIPSY | table interpolation program for stand yields |
| TSA | timber supply area |
| TSR | timber supply review |
| VDYP | variable density yield projection |
| VQO | visual quality objective |
| WT | working target |

Species abbreviations: B or Ba - balsam fir; Cw - western redcedar; Fd - Douglas-fir; Fdi - interior Douglas-fir; Hw - western hemlock; Pl - lodgepole pine; S - spruce species.

Site class abbreviations: G - good; M - medium; P - poor; L - low.

# Boundary TSA Large Log Analysis

## Lodgepole pine: Target - 25.0 cm DBHg, 12.5 cm DBH utilization

| Row # | Species | %inv | SI[2] | Regime Area | | Space frm/to | Reference | | | Target | Harv Age | Harv Ht (m) | MAI | LRF bf/m3 | Total | | Largest 250 | | DBH class[1] | | | | | | | | | | | | | | 5m large log[3]- % tot hrvst vol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | 0 - 10 cm | | 15 - 20 cm | | | | 25 - 30 cm | | | | 35+ cm | | | | |
| | | | | spaced | not space | | Cul Age | Cul Vol | Cul MAI | DBHg -all (0.0+) | | | | | Vol (12.5c m util) | Trees -all (0.0+) | Vol | DBHg | # trees | % tot trees | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | |
| 1 | **Pl** | | **21** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | comparison | | | | | nat10000/unspaced | 91 | 403 | 4.43 | 25.0 | 101 | 27.2 | 4.19 | 249 | 423 | 861 | 227 | 32.9 | 22 | 3 | 325 | 38 | 81 | 19 | 427 | 50 | 244 | 58 | 88 | 10 | 98 | 23 | 0.0 |
| 3 | comparison | | | | | nat5000/unspaced | 67 | 320 | 4.78 | 25.0 | 91 | 26.2 | 4.48 | 245 | 407 | 907 | 207 | 32.8 | 15 | 2 | 364 | 40 | 82 | 20 | 446 | 49 | 243 | 60 | 82 | 9 | 82 | 20 | 0.0 |
| 4 | | | | **200** | | **nat5000/1600** | **69** | **334** | **4.84** | **25.0** | **78** | **24.1** | **4.81** | **235** | **366** | **927** | **176** | **32.3** | **7** | **1** | **363** | **39** | **72** | **20** | **483** | **52** | **231** | **63** | **73** | **8** | **62** | **17** | **0.5** |
| 5 | comparison | | | | | nat5000/1400 | 71 | 334 | 4.71 | 25.0 | 70 | 23.1 | 4.70 | 231 | 329 | 882 | 165 | 32.3 | 15 | 2 | 337 | 38 | 63 | 19 | 449 | 51 | 202 | 61 | 70 | 8 | 64 | 19 | 0.0 |
| 6 | comparison | | | | | nat5000/1000 | 77 | 343 | 4.46 | 25.0 | 56 | 20.1 | 4.15 | 220 | 232 | 733 | 129 | 31.3 | 22 | 3 | 248 | 34 | 41 | 18 | 403 | 55 | 151 | 65 | 60 | 8 | 39 | 17 | 0.0 |
| 7 | | | | **300** | | **plt2500/1400** | **63** | **303** | **4.89** | **25.0** | **72** | **23.9** | **4.82** | **227** | **347** | **906** | **172** | **32.2** | **7** | **1** | **355** | **39** | **69** | **20** | **460** | **51** | **208** | **60** | **84** | **9** | **70** | **20** | **0.8** |
| 8 | comparison | | | | | plt2500/900 | 68 | 312 | 4.59 | 25.0 | 50 | 19.4 | 4.22 | 213 | 211 | 694 | 117 | 30.5 | 14 | 2 | 217 | 31 | 35 | 17 | 420 | 61 | 149 | 71 | 45 | 6 | 27 | 13 | 0.0 |
| 9 | | | | | **150** | **plt1600/unspaced** | **66** | **314** | **4.75** | **25.0** | **83** | **25.3** | **4.54** | **229** | **377** | **958** | **182** | **32.4** | **5** | **1** | **373** | **39** | **73** | **19** | **512** | **53** | **239** | **63** | **70** | **7** | **65** | **17** | **0.4** |
| 10 | **Pl** | | **15** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | comparison | | | | | nat10000/unspaced | 101 | 258 | 2.55 | 24.6[4] | 250 | 26.9 | 1.52 | 247 | 381 | 821 | 220 | 32.6 | 29 | 4 | 330 | 40 | 79 | 21 | 388 | 47 | 219 | 57 | 75 | 9 | 83 | 22 | 0.0 |
| 12 | | | | **100** | | **nat5000/1400** | **97** | **245** | **2.53** | **25.0** | **134** | **23.0** | **2.36** | **231** | **316** | **855** | **164** | **32.2** | **15** | **2** | **330** | **39** | **61** | **19** | **433** | **51** | **194** | **61** | **75** | **9** | **61** | **19** | **0.3** |
| 13 | comparison | | | | | nat5000/1000 | 100 | 234 | 2.34 | 25.0 | 97 | 20.1 | 2.34 | 220 | 227 | 718 | 128 | 31.3 | 22 | 3 | 244 | 34 | 41 | 18 | 394 | 55 | 148 | 65 | 58 | 8 | 38 | 17 | 0.0 |
| 14 | | | | **100** | | **plt2500/1400** | **93** | **246** | **2.65** | **25.0** | **147** | **23.9** | **2.26** | **227** | **333** | **872** | **171** | **32.1** | **8** | **1** | **343** | **39** | **67** | **20** | **441** | **51** | **200** | **60** | **79** | **9** | **66** | **20** | **0.3** |
| 15 | comparison | | | | | plt2500/900 | 93 | 224 | 2.41 | 25.0 | 86 | 19.3 | 2.37 | 212 | 204 | 681 | 115 | 30.3 | 14 | 2 | 218 | 32 | 35 | 17 | 409 | 60 | 143 | 70 | 40 | 6 | 24 | 12 | 0.0 |
| 16 | | | | | **150** | **plt1600/unspaced** | **95** | **247** | **2.60** | **25.0** | **182** | **25.3** | **1.96** | **229** | **356** | **908** | **182** | **32.4** | **4** | **0** | **354** | **39** | **69** | **19** | **484** | **53** | **226** | **63** | **66** | **7** | **61** | **17** | **0.4** |
| 17 | **Subtot.** | **40** | | **700** | **300** | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2.1 |

[1] Actual ranges are 0 - 12.5 cm, 12.6 - 22.5 cm, 22.6 - 32.5, and 32.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

[4] Exceeds TIPSY data: max's out at DBHg =24.6 at age 250

Assumptions:
OAF1 - 15%; OAF2 - 5%

# Boundary TSA Large Log Analysis

## Larch / Douglas-fir : Target - 30.0 cm DBHg, 17.5 cm DBH utilization

| Row # | Species | %inv | SI[2] | Regime Area |  | Space frm/to | Reference |  |  | Target | Harv Age | Harv Ht (m) | MAI | LRF bf/m3 | Total |  | Largest 250 |  | DBH class[1] |  |  |  |  |  |  |  |  |  |  |  |  |  | 5m large log[3] - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 - 15 cm |  | 20 - 25 cm |  |  |  | 30 - 40 cm |  |  |  | 45+ cm |  |  |  |  |
|  |  |  |  | spaced | not space |  | Cul Age | Cul Vol | Cul MAI | DBHg -all (0.0+) |  |  |  |  | Vol (17.5cm util) | Trees -all (0.0+) | Vol | DBHg | # trees | % tot trees | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | % tot hrvst vol |
| 1 | Fd[4] |  | 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | comparison |  |  |  |  | nat5000/unspaced | 136 | 374 | 2.75 | 29.7[5] | 239 | 37.2 | 2.25 | 270 | 538 | 742 | 470 | 44.8 | 212 | 29 | 211 | 28 | 69 | 13 | 209 | 28 | 232 | 43 | 108 | 15 | 238 | 44 | 0.0 |
| 3 |  |  |  |  | 100 | nat3000/unspaced | 135 | 376 | 2.78 | 30.0 | 210 | 35.8 | 2.44 | 261 | 513 | 718 | 426 | 43.5 | 180 | 25 | 213 | 30 | 69 | 13 | 236 | 33 | 262 | 51 | 89 | 12 | 183 | 36 | 0.5 |
| 4 |  |  |  | 50 |  | nat3000/1400 | 135 | 374 | 2.77 | 30.0 | 177 | 33.7 | 2.62 | 257 | 464 | 684 | 374 | 42.0 | 144 | 21 | 208 | 30 | 64 | 14 | 258 | 38 | 262 | 56 | 73 | 11 | 138 | 30 | 0.2 |
| 5 | comparison |  |  |  |  | nat3000/900 | 138 | 376 | 2.72 | 30.0 | 135 | 30.1 | 2.72 | 251 | 367 | 588 | 288 | 38.9 | 91 | 15 | 170 | 29 | 53 | 14 | 294 | 50 | 257 | 70 | 34 | 6 | 57 | 16 | 0.0 |
| 6 |  |  |  |  | 100 | plt2000/unspaced | 133 | 372 | 2.79 | 30.0 | 223 | 36.6 | 2.36 | 263 | 527 | 731 | 455 | 44.4 | 189 | 26 | 222 | 30 | 67 | 13 | 215 | 29 | 234 | 44 | 104 | 14 | 226 | 43 | 0.6 |
| 7 |  |  |  | 50 |  | plt2000/1200 | 132 | 375 | 2.84 | 30.0 | 173 | 33.6 | 2.69 | 258 | 465 | 685 | 379 | 42.2 | 147 | 21 | 207 | 30 | 64 | 14 | 253 | 37 | 254 | 55 | 77 | 11 | 148 | 32 | 0.2 |
| 8 | comparison |  |  |  |  | plt2000/900 | 132 | 378 | 2.87 | 30.0 | 139 | 30.8 | 2.86 | 252 | 397 | 617 | 309 | 39.5 | 97 | 16 | 192 | 31 | 62 | 16 | 285 | 46 | 263 | 66 | 42 | 7 | 72 | 18 | 0.0 |
| 8 | comparison |  |  |  |  | plt2000/700 | 134 | 374 | 2.79 | 30.0 | 115 | 28.1 | 2.73 | 246 | 314 | 516 | 250 | 37.3 | 54 | 10 | 162 | 31 | 53 | 17 | 279 | 54 | 229 | 73 | 20 | 4 | 31 | 10 | 0.0 |
| 9 | comparison |  |  |  |  | plt1600/unspaced | 133 | 371 | 2.79 | 30.0 | 211 | 36.0 | 2.44 | 264 | 515 | 731 | 442 | 44.2 | 180 | 25 | 236 | 32 | 72 | 14 | 214 | 29 | 230 | 45 | 102 | 14 | 213 | 41 | 0.0 |
| 10 | comparison |  |  |  |  | plt1200/unspaced | 132 | 373 | 2.83 | 30.0 | 177 | 33.9 | 2.65 | 258 | 469 | 699 | 382 | 42.5 | 133 | 19 | 238 | 34 | 70 | 15 | 248 | 35 | 244 | 52 | 81 | 12 | 154 | 33 | 0.0 |
| 11 | Subtot | 20 |  | 100 | 200 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1.5 |

[1] Actual ranges are 0 - 17.5 cm, 17.6 - 32.5 cm, 32.6 - 42.5, and 42.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

[4] TIPSY does not contain data for Larch. Fdi is the recommended substitute

[5] TIPSY data base limits reached at 29.7 cm DBH at 239 years

Assumptions
OAF1 - 15%, OAF2 - 5%

## Boundary TSA Large Log Analysis

### Spruce / Balsam / Other : Target - 25.0 cm DBHg, 17.5 cm DBH utilization

| Row # | Species | %inv | SI[2] | Regime Area |  | Space frm/to | Reference |  |  | Target | Harv Age | Harv Ht (m) | MAI | LRF bf/m3 | Total |  | Largest 250 |  | DBH class[1] |  |  |  |  |  |  |  |  |  |  |  |  |  | 5m large log [3] - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 - 10 cm |  | 15 - 20 cm |  |  |  | 25 - 30 cm |  |  |  | 35+ cm |  |  |  |  |
|  |  |  |  | spaced | not space |  | Cul Age | Cul Vol | Cul MAI | DBHg -all (0.0+) |  |  |  |  | Vol (17.5c m util) | Trees -all (0.0+) | Vol | DBHg | # trees | % tot trees | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | % tot hrvst vol |
| 1 | **Sw[4]** |  | **16** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | comparison |  |  |  |  | nat5000/unspaced | 122 | 388 | 3.18 | 27.5 | 147 | 29.9 | 3.02 | 256 | 444 | 779 | 278 | 36.9 | 21 | 3 | 235 | 30 | 57 | 13 | 350 | 45 | 197 | 44 | 173 | 22 | 200 | 45 | 0.0 |
| 3 |  |  |  |  | **400** | **plt2300/unspaced** | **108** | **370** | **3.43** | **27.5** | **140** | **29.9** | **3.12** | **242** | **437** | **801** | **263** | **36.5** | **1** | **0** | **245** | **31** | **57** | **13** | **395** | **49** | **211** | **48** | **159** | **20** | **179** | **41** | 2.3 |
| 4 |  |  |  | **100** |  | **plt2300/1545[5]** | **108** | **386** | **3.57** | 27.5 | **128** | **28.6** | **3.39** | **241** | **434** | **833** | **251** | **36.6** | **4** | **0** | **248** | **30** | **54** | **12** | **417** | **50** | **212** | **49** | **166** | **20** | **176** | **41** | 0.6 |
| 8 | comparison |  |  |  |  | plt2000/900 | 108 | 370 | 3.42 | 27.5 | 92 | 23.3 | 3.21 | 234 | 295 | 693 | 188 | 35.1 | 10 | 1 | 200 | 29 | 36 | 12 | 343 | 49 | 149 | 51 | 139 | 20 | 116 | 39 | 0.0 |
| 10 | comparison |  |  |  |  | plt1200/unspaced | 108 | 375 | 3.47 | 27.5 | 114 | 26.9 | 3.45 | 241 | 394 | 833 | 226 | 36.4 | 6 | 1 | 246 | 30 | 49 | 12 | 409 | 49 | 190 | 48 | 173 | 21 | 162 | 41 | 0.0 |
| 11 | **Subtot.** | **20** |  | **100** | **400** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 2.8 |

[1] Actual ranges are 0 - 12.5 cm, 12.6 - 22.5 cm, 22.6 - 32.5, and 32.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

[4] TIPSY does not contain data for Balsam. Sw is the recommended substitute

[5] TIPSY data base limits reached at spacing to 1545 (district regime is to 1600)

Assumptions
OAF1 - 15%, OAF2 - 5%

## Boundary TSA Large Log Analysis

### Lodgepole pine: Target - Harvest Age 60 for SI 21 & Age 80 for SI 15, 12.5 cm DBH utilization

| Row # | Species | %inv | SI[2] | Regime Area spaced | Regime Area not space | Space frm/to | Reference Cul Age | Reference Cul Vol | Reference Cul MAI | DBHg -all (0.0+) | Target Harv Age | Harv Ht. (m) | MAI | LRF bf/m3 | Total Vol (12.5cm util) | Total Trees -all (0.0+) | Largest 250 Vol | Largest 250 DBHg | DBH class[1] 0 - 10 cm # trees | 0 - 10 cm % tot trees | 15 - 20 cm # trees | 15 - 20 cm % tot trees | 15 - 20 cm vol | 15 - 20 cm % tot vol | 25 - 30 cm # trees | 25 - 30 cm % tot trees | 25 - 30 cm vol | 25 - 30 cm % tot vol | 35+ cm # trees | 35+ cm % tot trees | 35+ cm vol | 35+ cm % tot vol | 5m large log[3] - % tot hrvst vol |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pl | | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | comparison | | | | | nat10000/unspaced | 91 | 403 | 4.43 | 17.7 | 60 | 21.1 | 4.64 | 209 | 279 | 1656 | 119 | 27.0 | 469 | 28 | 897 | 54 | 151 | 54 | 282 | 17 | 121 | 43 | 8 | 0 | 6 | 2 | 0.0 |
| 3 | comparison | | | | | nat5000/unspaced | 67 | 320 | 4.78 | 19.4 | 60 | 21.1 | 4.72 | 211 | 283 | 1396 | 122 | 28.1 | 238 | 17 | 799 | 57 | 129 | 46 | 345 | 25 | 142 | 50 | 14 | 1 | 11 | 4 | 0.0 |
| 4 | | | | **200** | | **nat5000/1600** | **69** | **334** | **4.84** | **22.3** | 60 | **21.1** | **4.76** | **217** | **285** | **1064** | **128** | **29.6** | **60** | **6** | **532** | **50** | **89** | **31** | **449** | **42** | **178** | **62** | **25** | **2** | **18** | **6** | **0.2** |
| 5 | comparison | | | | | nat5000/1400 | 71 | 334 | 4.71 | 23.3 | 60 | 21.1 | 4.60 | 219 | 276 | 950 | 133 | 30.4 | 45 | 5 | 429 | 45 | 72 | 26 | 433 | 46 | 172 | 62 | 44 | 5 | 31 | 11 | 0.0 |
| 6 | comparison | | | | | nat5000/1000 | 77 | 343 | 4.46 | 25.9 | 60 | 21.1 | 4.27 | 225 | 256 | 722 | 143 | 32.2 | 16 | 2 | 221 | 31 | 39 | 15 | 400 | 55 | 159 | 62 | 85 | 12 | 59 | 23 | 0.0 |
| 7 | | | | **300** | | **plt2500/1400** | **63** | **303** | **4.89** | **23.1** | 60 | **21.7** | **4.89** | **214** | **293** | **1002** | **138** | **30.3** | **38** | **4** | **485** | **48** | **84** | **29** | **433** | **43** | **177** | **60** | **45** | **4** | **33** | **11** | **0.5** |
| 8 | comparison | | | | | plt2500/900 | 68 | 312 | 4.59 | 27.0 | 60 | 21.7 | 4.53 | 225 | 272 | 681 | 153 | 32.8 | 8 | 1 | 159 | 23 | 29 | 11 | 416 | 61 | 173 | 64 | 99 | 15 | 70 | 26 | 0.0 |
| 9 | | | | | **150** | **plt1600/unspaced** | **66** | **314** | **4.75** | **22.0** | **60** | **21.3** | **4.73** | **207** | **284** | **1126** | **124** | **29.1** | **39** | **3** | **627** | **56** | **100** | **35** | **436** | **39** | **165** | **58** | **24** | **2** | **18** | **6** | **0.1** |
| 10 | Pl | | 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | comparison | | | | | nat10000/unspaced | 101 | 258 | 2.55 | 14.6 | 80 | 18.1 | 2.41 | 187 | 192 | 2191 | 78 | 23.9 | 1013 | 46 | 1044 | 48 | 146 | 76 | 134 | 6 | 46 | 24 | 0 | 0 | 0 | 0 | 0.0 |
| 12 | | | | **100** | | **nat5000/1400** | **97** | **245** | **2.53** | **20.7** | **80** | **18.1** | **2.36** | **198** | **189** | **1000** | **89** | **27.4** | **101** | **10** | **560** | **56** | **81** | **43** | **329** | **33** | **103** | **54** | **10** | **1** | **5** | **3** | **0.0** |
| 13 | comparison | | | | | nat5000/1000 | 100 | 234 | 2.34 | 23.1 | 80 | 18.1 | 2.15 | 205 | 172 | 738 | 96 | 29.0 | 37 | 5 | 317 | 43 | 47 | 27 | 366 | 50 | 115 | 67 | 18 | 2 | 10 | 6 | 0.0 |
| 14 | | | | **100** | | **plt2500/1400** | **93** | **246** | **2.65** | **20.7** | **80** | **18.5** | **2.55** | **193** | **204** | **1049** | **92** | **27.2** | **80** | 8 | **644** | **61** | **96** | **47** | **316** | **30** | **103** | **50** | **8** | **1** | **5** | **2** | **0.0** |
| 15 | comparison | | | | | plt2500/900 | 93 | 224 | 2.41 | 24.4 | 80 | 18.5 | 2.29 | 205 | 184 | 685 | 103 | 29.5 | 15 | 2 | 248 | 36 | 39 | 21 | 398 | 58 | 130 | 71 | 24 | 4 | 14 | 8 | 0.0 |
| 16 | | | | | **150** | **plt1600/unspaced** | **95** | **247** | **2.60** | **20.0** | **80** | **18.3** | **2.46** | **184** | **197** | **1145** | **83** | **26.2** | **66** | **6** | **798** | **70** | **111** | **56** | **276** | **24** | **84** | **43** | **5** | **0** | **3** | **2** | **0.0** |
| 17 | **Subtot.** | **40** | | **700** | **300** | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0.7 |

[1] Actual ranges are 0 - 12.5 cm, 12.6 - 22.5 cm, 22.6 - 32.5, and 32.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume.

[4] Exceeds TIPSY data: max's out at DBHg =24.6 at age 250

Assumptions:
OAF1 - 15%; OAF2 - 5%

# Boundary TSA Large Log Analysis

## Larch / Douglas-fir : Target - Harvest Age 100, 17.5 cm DBH utilization

| Row # | Species | %inv | SI[2] | Regime Area |  | Space frm/to: | Reference |  |  | DBHg -all (0.0+) | Target Harv Age | Harv Ht. (m) | MAI | LRF bf/m3 | Total |  | Largest 250 |  | DBH class[1] |  |  |  |  |  |  |  |  |  |  |  |  |  | 5m large log[3] - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0 - 15 cm |  | 20 - 25 cm |  |  |  | 30 - 40 cm |  |  |  | 45+ cm |  |  |  |  |
|  |  |  |  | spaced | not space |  | Cul Age | Cul Vol | Cul MAI |  |  |  |  |  | Vol (17.5cm util) | Trees -all (0.0+) | Vol | DBHg | # trees | % tot trees | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | % tot hrvst vol |
| 1 | **Fd[4]** |  | **18** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | comparison |  |  |  |  | nat5000/unspaced | 136 | 374 | 2.75 | 18.6 | 100 | 25.6 | 2.56 | 223 | 256 | 1429 | 170 | 30.8 | 851 | 60 | 403 | 28 | 131 | 51 | 174 | 12 | 123 | 48 | 1 | 0 | 1 | 0 | 0.0 |
| 3 |  |  |  |  | **100** | **nat3000/unspaced** | **135** | **376** | **2.78** | **20.3** | **100** | **25.6** | **2.59** | **217** | **259** | **1154** | **171** | **31.3** | **572** | **50** | **393** | **34** | **126** | **49** | **188** | **16** | **132** | **51** | **1** | **0** | **1** | **0** | **0.0** |
| 4 |  |  |  | **50** |  | **nat3000/1400** | **135** | **374** | **2.77** | 22.8 | **100** | **25.6** | **2.60** | **222** | **260** | **870** | **177** | **32.1** | **306** | **35** | **351** | **40** | **110** | **42** | **212** | **24** | **147** | **57** | **2** | **0** | **2** | **1** | **0.0** |
| 5 | comparison |  |  |  |  | nat3000/900 | 138 | 376 | 2.72 | 25.9 | 100 | 25.6 | 2.53 | 231 | 253 | 625 | 184 | 33.2 | 121 | 19 | 261 | 42 | 84 | 33 | 240 | 38 | 165 | 65 | 4 | 1 | 5 | 2 | 0.0 |
| 6 |  |  |  |  | **100** | **plt2000/unspaced** | **133** | **372** | **2.79** | **20.5** | **100** | **26.0** | **2.64** | **217** | **264** | **1173** | **177** | **31.5** | **587** | **50** | **392** | **33** | **124** | **47** | **192** | **16** | **136** | **52** | **2** | **0** | **3** | **1** | **0.0** |
| 7 |  |  |  | **50** |  | **plt2000/1200** | **132** | **375** | **2.84** | **23.3** | **100** | **26.0** | **2.70** | **225** | **270** | **847** | **187** | **32.7** | **288** | **34** | **329** | **39** | **104** | **39** | **228** | **27** | **161** | **60** | **3** | **0** | **5** | **2** | **0.0** |
| 8 | comparison |  |  |  |  | plt2000/900 | 132 | 378 | 2.87 | 25.9 | 100 | 26.0 | 2.72 | 231 | 272 | 661 | 193 | 33.5 | 130 | 20 | 272 | 41 | 67 | 32 | 254 | 38 | 180 | 66 | 4 | 1 | 6 | 2 | 0.0 |
| 8 | comparison |  |  |  |  | plt2000/700 | 134 | 374 | 2.79 | 28.2 | 100 | 26.0 | 2.62 | 236 | 262 | 523 | 203 | 34.6 | 58 | 11 | 198 | 38 | 64 | 24 | 261 | 50 | 189 | 72 | 6 | 1 | 9 | 3 | 0.0 |
| 9 | comparison |  |  |  |  | plt1600/unspaced | 133 | 371 | 2.79 | 21.4 | 100 | 26.0 | 2.64 | 221 | 264 | 1052 | 180 | 31.8 | 463 | 44 | 390 | 37 | 120 | 45 | 196 | 19 | 138 | 52 | 4 | 0 | 6 | 2 | 0.0 |
| 10 | comparison |  |  |  |  | plt1200/unspaced | 132 | 373 | 2.83 | 23.6 | 100 | 26.0 | 2.69 | 224 | 269 | 826 | 183 | 32.5 | 235 | 28 | 372 | 45 | 113 | 42 | 216 | 26 | 151 | 56 | 2 | 0 | 3 | 1 | 0.0 |
| 11 | **Subtot.** | **20** |  | **100** | **200** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **0.0** |

[1] Actual ranges are 0 - 17.5 cm, 17.6 - 32.5 cm, 32.6 - 42.5, and 42.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

[4] TIPSY does not contain data for Larch. Fdi is the recommended substitute

[5]

Assumptions:
OAF1 - 15%; OAF2 - 5%

## Spruce / Balsam / Other : Target - Harvest Age 100, 17.5 cm DBH utilization

| | | | | Regime Area | | | Reference | | | | Target | | | | Total | | Largest 250 | | DBH class[1] | | | | | | | | | | | | | | 5m large log[3] - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | 0 - 10 cm | | 15 - 20 cm | | | | 25 - 30 cm | | | | 35+ cm | | | | |
| Row # | Species | %inv | SI[2] | spaced | not space | Space frm/to | Cul Age | Cul Vol | Cul MAI | DBHg -all (0.0+) | Harv Age | Harv Ht (m) | MAI | LRF bf/m3 | Vol (17.5cm util) | Trees -all (0.0+) | Vol | DBHg | # trees | % tot trees | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | # trees | % tot trees | vol | % tot vol | % tot hrvst vol |
| 1 | **Sw[4]** | | **16** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | comparison | | | | | nat5000/unspaced | 122 | 388 | 3.18 | 20.8 | 100 | 23.5 | 2.92 | 220 | 292 | 1320 | 161 | 31.1 | 186 | 14 | 727 | 55 | 127 | 43 | 354 | 27 | 160 | 55 | 54 | 4 | 47 | 16 | 0.0 |
| 3 | | | | | **400** | **plt2300/unspaced** | **108** | **370** | **3.43** | **22.5** | **100** | **24.7** | **3.38** | **216** | **338** | **1208** | **179** | **32.3** | **64** | **5** | **659** | **55** | **115** | **34** | **408** | **34** | **187** | **55** | **79** | **7** | **70** | **21** | **1.2** |
| 4 | | | | **100** | | **plt2300/1545[5]** | **108** | **386** | **3.57** | 24.3 | **100** | **24.7** | **3.53** | **224** | **353** | **1036** | **188** | **33.5** | **29** | **3** | **471** | **45** | **87** | **25** | **434** | **42** | **196** | **56** | **101** | **10** | **91** | **26** | **0.4** |
| 8 | comparison | | | | | plt2000/900 | 108 | 370 | 3.42 | 28.6 | 100 | 24.7 | 3.36 | 239 | 336 | 681 | 216 | 36.6 | 7 | 1 | 170 | 25 | 32 | 10 | 327 | 43 | 150 | 45 | 178 | 26 | 159 | 47 | 0.0 |
| 10 | comparison | | | | | plt1200/unspaced | 108 | 375 | 3.47 | 26.1 | 100 | 24.7 | 3.41 | 233 | 341 | 874 | 192 | 34.6 | 13 | 1 | 315 | 36 | 59 | 17 | 424 | 49 | 186 | 55 | 122 | 14 | 106 | 31 | 0.0 |
| 11 | **Subtot.** | **20** | | **100** | **400** | | | | | | | | | | | | | | | | | | | | | | | | | | | | **1.5** |

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[1] Actual ranges are 0 - 12.5 cm, 12.6 - 22.5 cm, 22.6 - 32.5, and 32.6 + cm

[2] From Martin, 1999. *ISIS Polygon Area by Site Index Class*

[3] 1st 5 m log assumed to be 25% of tree volume. Volume calculated is a % of total harvest volume based on proportion of annual harvested area under a particular regime, **not** a % of stand volume

[4] TIPSY does not contain data for Balsam. Sw is the recommended substitute

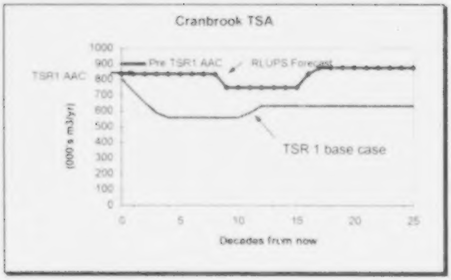
[5] TIPSY data base limits reached at spacing to 1545 (district regime is to 1600)

Assumptions:
OAF1 - 15%, OAF2 - 5%

## QUANTITY

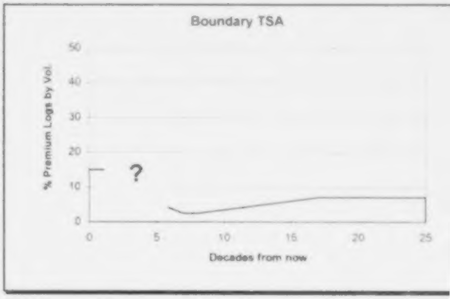
| Decade | Cranbrook A | Cranbrook T | Pre-TSR1 AA | TSR1 AAC | Potential | Increment |
|---|---|---|---|---|---|---|
| 0 | 838 | 807 | 901 | 850 | 680 | -158 |
| 1 | 838 | 726 | 901 | 850 | 680 | -158 |
| 2 | 838 | 653 | 901 | 850 | 680 | -158 |
| 3 | 838 | 588 | | | 680 | -158 |
| 4 | 838 | 559 | | | 680 | -158 |
| 5 | 838 | 559 | | | 680 | -158 |
| 6 | 838 | 559 | | | 634 | -204 |
| 7 | 838 | 559 | | | 634 | -204 |
| 16 | 838 | 633 | | | 710 | -167 |
| 17 | 877 | 633 | | | 710 | -167 |
| 18 | 877 | 633 | | | 710 | -167 |
| 19 | 877 | 633 | | | 710 | -167 |
| 20 | 877 | 633 | | | 710 | -167 |
| 21 | 877 | 633 | | | 710 | -167 |
| 22 | 877 | 633 | | | 710 | -167 |
| 23 | 877 | 633 | | | 710 | -167 |
| 24 | 877 | 633 | | | 710 | -167 |
| 25 | 877 | 633 | | | | |

Cranbrook



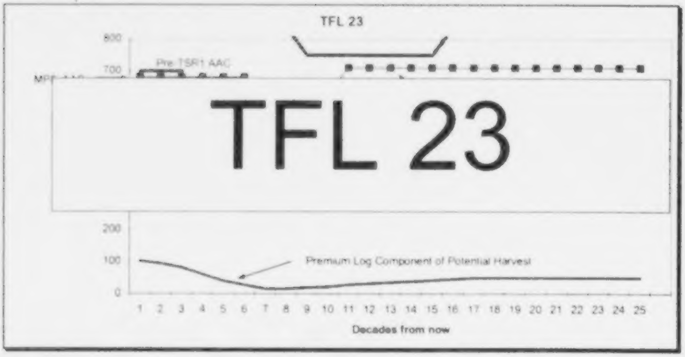
## QUALITY

| Decade | Boundary | |
|---|---|---|
| 0 | 15.0 | 25 |
| 1 | 15.0 | 25 |
| 2 | 14.0 | 24 |
| 3 | 12.0 | 22 |
| 4 | 9.0 | 19 |
| 5 | 6.0 | 16 |
| 6 | 4.0 | 14 |
| 7 | 2.5 | 13 |
| 8 | 2.5 | 13 |
| 9 | 3.0 | 13 |
| 10 | 3.5 | 14 |
| 11 | 4.0 | 14 |
| 12 | 4.5 | 15 |
| 13 | 5.0 | 15 |
| 14 | 5.5 | 16 |
| 15 | 6.0 | 16 |
| 16 | 6.5 | 17 |
| 17 | 7.0 | 17 |
| 18 | 7.0 | 17 |
| 19 | 7.0 | 17 |
| 20 | 7.0 | 17 |
| 21 | 7.0 | 17 |
| 22 | 7.0 | 17 |
| 23 | 7.0 | 17 |
| 24 | 7.0 | 17 |
| 25 | 7.0 | 17 |



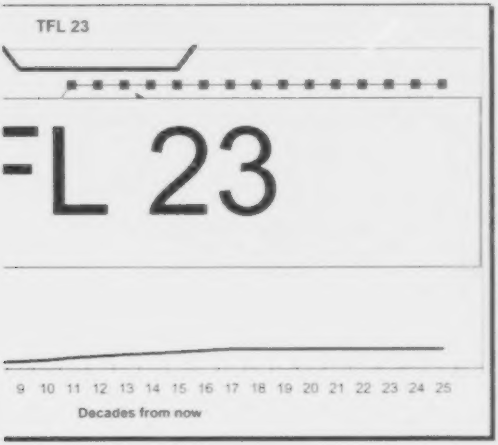
## COMBINED

| Decade | TFL 23 Poter | Previous AAI | Current AAC | Quality % | Quality Vol |
|---|---|---|---|---|---|
| 1 | 680 | 700 | 680 | 15 | 102 |
| 2 | 680 | 700 | 680 | 14 | 95 |
| 3 | 680 | 700 | 680 | 12 | 82 |
| 4 | 680 | | | 9 | 61 |
| 5 | 680 | | | 6 | 41 |
| 6 | 680 | | | 4 | 27 |
| 7 | 634 | | | 2.5 | 16 |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] | [redacted] | [redacted] | [redacted] |
| 17 | 710 | | | 7 | 50 |
| 18 | 710 | | | 7 | 50 |
| 19 | 710 | | | 7 | 50 |
| 20 | 710 | | | 7 | 50 |
| 21 | 710 | | | 7 | 50 |
| 22 | 710 | | | 7 | 50 |
| 23 | 710 | | | 7 | 50 |
| 24 | 710 | | | 7 | 50 |
| 25 | 710 | | | 7 | 50 |



[redacted]

23


TFL 23
L 23
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Decades from now

# Table 1. Regime Table for Boundary TSA, developed at the Silviculture Planning Workshop, July 21-22,1999.

| | Strategy | Opportunity | Timber Supply Effects | | | | Habitat | Jobs | Cost | Workshop |
|---|---|---|---|---|---|---|---|---|---|---|
| Regimes | | Area (Ha/Yr) | Short | Medium | Long | Quality | | Days/ha | \$/ha[1] | Rank |
| **Survey** | | | | | | | | | | |
| 1 Surveys | | 5,400 | | | | | | 0.1 | 20 | 1 |
| **Backlog** | | | | | | | | | | |
| 2 NSR | L1 (a) | 100 | | + | + | | | 0.8 | 550 | 1 |
| 3 Brushing | L1 (b) | 400 | | | + | | +/- | 3.5 | 600 | 2 |
| **Pre FG** | | | | | | | | | | |
| 4 improved seed | M2(b)(i) | 1440 | | + | | | | 0 | 80 - B | B-1 |
| 5 larger planting stock | M2(b)(ii) | 300 | | + | | | | 0.5 | 153 - B | B-2 |
| 6 fertilize existing regen (accelerate greenup)[1] | M2(a-i)(b-viii) | 1200 | + | + | | | | 0.1 | 300 | B-3 |
| 7 plant Pw | M2(b)(ix) | 500 | | + | + | + | | 0 | B | B-1 |
| 8 space repressed Pl[2] | M2(a)(ii) | 400 | | + | + | + | + | 3.5 | 550 | 2 |
| 9 push-over /stumping | L4(a) | 400 | | | + | | - | 1 | B | B-4 |
| 10 plant alternative species(larch, Py, Pw, Ep) | L4(b) | 1440 | | | + | | + | 0 | B | B-2 |
| 11 small diameter spacing[2] | L4(e) | 800 | | + | + | | | 3.5 | 550 | B-4 |
| 12 pop-up spacing[2] | L4(c) | 10 | | + | + | | | 3.5 | 550 | 6 |
| **Post FG** | | | | | | | | | | |
| 13 spacing stands for future PH/CT[2] | M3 (a) | 600 | | + | + | + | + | 3.5 | 550 | 3 |
| 14 spacing stands for quality[2] | Q1 | 500 | | + | + | + | + | 3.5 | 550 | 3 |
| 15 Fertilize late rotation[1] | S1 | 530 | + | | | | + | 0.1 | 300 | 5 |
| 16 Fertilize (spaced (#13), planned for PH/CT)[1] | M3 (b) | 600 | | + | +/- | | + | | | 5 |
| 17 Prune (100 ha 1st lift, 50 ha 2nd lift) | Q2 | 150 | | | - | + | + | 6 | 965 | 4 |

Notes:

## Incremental Silviculture Program Table - Ha, Boundary TSA July 21-22, 1999

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| Year | Surveys* | Establish | Maintain | Space Repressed | | | | Total |
| 1 | 5,400 | 100 | 400 | 400 | 1,110 | 150 | 2,330 | 9,890 |
| 2 | 5,400 | 100 | 300 | 400 | 1,110 | 150 | 2,330 | 9,790 |
| 3 | 5,400 | 100 | 200 | 400 | 1,110 | 150 | 2,330 | 9,690 |
| 4 | 5,400 | | 200 | 400 | 1,110 | 150 | 2,330 | 9,590 |
| 5 | 5,400 | | 100 | 400 | 1,110 | 150 | 2,330 | 9,490 |
| Subtot Yr 1 - 5 | 27,000 | 300 | 1,200 | 2,000 | 5,550 | 750 | 11,650 | 48,450 |
| 6 - 10 | 27,000 | - | 150 | - | 5,550 | 750 | 11,650 | 45,100 |
| Total Yr 1 - 10 | 54,000 | 300 | 1,350 | 2,000 | 11,100 | 1,500 | 23,300 | 93,550 |

* Includes prescription and layout

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Unit cost ($/ha) | 20 | 550 | 600 | 550 | 550 | 965 | 300 | |

## Program Table - $ 000s, Boundary TSA July 21-22, 1999

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| Year | Surveys* | Establish | Maintain | Space Repressed | | - | - | Total |
| 1 | 108 | 55 | 240 | 220 | 611 | 145 | 699 | 2,077 |
| 2 | 108 | 55 | 180 | 220 | 611 | 145 | 699 | 2,017 |
| 3 | 108 | 55 | 120 | 220 | 611 | 145 | 699 | 1,957 |
| 4 | 108 | - | 120 | 220 | 611 | 145 | 699 | 1,902 |
| 5 | 108 | - | 60 | 220 | 611 | 145 | 699 | 1,842 |
| Subtot Yr 1 - 5 | 540 | 165 | 720 | 1,100 | 3,053 | 724 | 3,495 | 9,796 |
| 6 - 10 | 540 | - | 90 | - | 3,053 | 724 | 3,495 | 7,901 |
| Total Yr 1 - 10 | 1,080 | 165 | 810 | 1,100 | 6,105 | 1,448 | 6,990 | 17,698 |

* Includes prescription and layout

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes.

## Program Job Outcomes, Boundary TSA July 21-22, 1999

***Short term*** *employment associated with undertaking the silviculture activity, in person years*

| | | | Backlog | | Space** | Prune | Fertilize | |
|---|---|---|---|---|---|---|---|---|
| **Year** | **Surveys*** | **Establish** | **Maintain** | **Space Repressed** | - | - | - | **Total** |
| 1 | 2.7 | 0.4 | 7.0 | 7.0 | 19.4 | 4.5 | 1.2 | 42.2 |
| 2 | 2.7 | 0.4 | 5.3 | 7.0 | 19.4 | 4.5 | 1.2 | 40.4 |
| 3 | 2.7 | 0.4 | 3.5 | 7.0 | 19.4 | 4.5 | 1.2 | 38.7 |
| 4 | 2.7 | - | 3.5 | 7.0 | 19.4 | 4.5 | 1.2 | 38.3 |
| 5 | 2.7 | - | 1.8 | 7.0 | 19.4 | 4.5 | 1.2 | 36.5 |
| Subtot Yr 1 - 5 | 13.5 | 1.2 | 21.0 | 35.0 | 97.1 | 22.5 | 5.8 | 196.2 |
| 6 – 10 | 13.5 | - | 2.6 | - | 97.1 | 22.5 | 5.8 | 141.6 |
| Total Yr 1 - 10 | 27.0 | 1.2 | 23.6 | 35.0 | 194.3 | 45.0 | 11.7 | 337.7 |

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job

** Does not include 800 ha/yr of small-diameter basic spacing for root rot control purposes

***Long term*** *employment associated with improved quality and quantity of the timber resource*

| | Harvest | Incremental Jobs | |
|---|---|---|---|
| **Decade** | **Increment ('000 m3)** | **per year Region[2]** | **per decade Region[2]** |
| 1 | #REF! | #REF! | #REF! |
| 2 | #REF! | #REF! | #REF! |
| 3 | #REF! | #REF! | #REF! |
| 4 | #REF! | #REF! | #REF! |
| 5 | #REF! | #REF! | #REF! |
| 6 | #REF! | #REF! | #REF! |
| 7 | #REF! | #REF! | #REF! |
| 8 | #REF! | #REF! | #REF! |
| 9 | #REF! | #REF! | #REF! |
| 10 | #REF! | #REF! | #REF! |
| 11 | #REF! | #REF! | #REF! |
| 12 | #REF! | #REF! | #REF! |
| 13 | #REF! | #REF! | #REF! |
| 14 | #REF! | #REF! | #REF! |
| 15 | #REF! | #REF! | #REF! |
| 16 | #REF! | #REF! | #REF! |
| 17 | #REF! | #REF! | #REF! |
| 18 | #REF! | #REF! | #REF! |
| 19 | #REF! | #REF! | #REF! |
| 20 | #REF! | #REF! | #REF! |
| 21 | #REF! | #REF! | #REF! |
| 22 | #REF! | #REF! | #REF! |
| 23 | #REF! | #REF! | #REF! |
| 24 | #REF! | #REF! | #REF! |
| 25 | #REF! | #REF! | #REF! |
| **Total** | | | #REF! |

Notes:

1. Assumes continuation of the silviculture program beyond the first 10 years, in accordance with the strategy. The total harvest increment is associated with all the silvicultural practices documented in the "Opportunities" section and is only partly attributable to spacing and fertilization practices. Some of the increase may be associated with pre-free growing silviculture that was not current practice at the time of strategy development.

2. Assumes 3.93 TSA level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre (Source: TFL 23 MP #9 Timber Supply Analysis Report, p.39)

## Topics Requiring Further Investigation

Investigate:

1 Fertilization of larch

2 TSR2 sensitivity analysis oof forest cover requirements in wildlife management zones.

3 Inventory past partial harvesting stands to classify them correctly. Is there a silv opportunity in residual stand of partial harvest?

4 (Encourage) development of Df improved seed.

5 Planting of white pine.

6 Potential of fertilization to reduce green-up age.

7 Confirm OAFs and site index .

8 Rehab potential of roads trails and landing.

9 Rehab of problem forest types excluded from tsr2 (Pl)

hyphaloma innoculate

chemical spacing

# Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement. The template design allows completion in a consistent format for all management units across the province. Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** Boundary TSA

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# Boundary TSA
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

## Activities

### Stand Tending

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 300 | 500 | 500 | 500 | 500 | 500.00 | 150000 |
| Pruning | 0 | 50 | 50 | 50 | 50 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 500 | 0 | 500 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 300 | 550 | 1050 | 550 | 1050 | 499.99 | 150,000 |
| Planning and prescriptions | 200 | 550 | 550 | 550 | 550 | | 25,000 |
| **Total dollars** | | | | | | | 175,000 |

### Forest Health Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

### Habitat Supply and Biodiversity Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

### Domestic Range

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

### Enhanced Forestry Activities - Management Unit Total

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 300 | 500 | 500 | 500 | 500 | 500.00 | 150,000 |
| Pruning | 0 | 50 | 50 | 50 | 50 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 500 | 0 | 500 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 300 | 550 | 1050 | 550 | 1050 | 499.99 | 150,000 |
| Planning and prescriptions | | | | | | | 25,000 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 175,000 |

# Boundary TSA
# Backlog Program Table
# For the 2001/02 Fiscal Year

| **Activities** | **Treatment Area Goals (ha)** | | | | | **Plan 2001/02** | |
|---|---|---|---|---|---|---|---|
| **Legal Obligations** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 96 | 75 | 50 | 0.00 | 0 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 96 | 75 | 50 | 0 | 0 | 718.75 | 69000 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 96 | 75 | 146 | 75 | 50 | 718.72 | 69,000 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 69,000 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Site preparation | 81 | 50 | 0 | 0 | 0 | 1,000.00 | 81000 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 81 | 50 | 0 | 0 | 0 | 999.99 | 81,000 |
| Seed purchase | 120000 | 0 | 0 | 0 | 0 | 0.30 | 36,000 |
| Prescriptions and planning dolla | 50 | 50 | 50 | 50 | 50 | | 10,000 |
| **Total backlog reforestation** | | | | | | | 127,000 |
| **Impeded areas** | | | | | | | |
| Surveys | 733 | 700 | 500 | 500 | 500 | 23.65 | 17337 |
| Brushing | 350 | 300 | 200 | 100 | 100 | 780.77 | 273270 |
| Density spacing | 17 | 50 | 50 | 50 | 50 | 0.00 | 11900 |
| **Totals hectares** | 1100 | 1050 | 750 | 650 | 650 | 275.01 | 302,507 |
| Prescriptions and planning dolla | 100 | 200 | 100 | 100 | 100 | | 30,000 |
| **Total impeded areas** | | | | | | | 332,507 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 0 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 733 | 700 | 596 | 575 | 550 | 23.65 | 17337 |
| Site preparation | 81 | 50 | 0 | 0 | 0 | 999.98 | 81000 |
| Planting | 96 | 75 | 50 | 0 | 0 | 718.74 | 69000 |
| Brushing | 350 | 300 | 200 | 100 | 100 | 780.77 | 273270 |
| Density spacing | 17 | 50 | 50 | 50 | 50 | 699.96 | 11900 |
| **Totals hectares** | 1277 | 1175 | 896 | 725 | 700 | 354.35 | 452507 |
| Seed purchase | 120000 | 0 | 0 | 0 | 0 | 0.30 | 36000 |
| Prescriptions and planning | | | | | | | 40,000 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 528,507 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

**Boundary TSA**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

***The following default provincial factors may be replaced by management unit specific factors.***
The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.
**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 |

**Years the factor will affect:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.
**Provincial factors for estimated value gain at harvest**

| | | |
|---|---|---|
| 5-15% | 15-30% | 1-5% |

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.
**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

***Area affected by tree improvement, seedling production and silviculture surveys***
Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| Area | | |
|---|---|---|
| Tree Improvement | Nursery Seedling Production | Silviculture Surveys |

**A Tree Improvement**
**Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002**

| | |
|---|---|
| Backlog area planted from backlog table | 96 |
| Enter area of all other sites planted with improved trees | |
| Total area affected by tree improvement | 96 |

**B Nursery production of seedlings**
Enter sowing requests from SPAR

**C Silviculture surveys**
Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.
These potentially provide improved estimates of site productivity and operational yield adjustment factors

| | |
|---|---|
| Total EFP surveys from the EFP table | 0 |
| Total backlog surveys from the backlog table. | 733 |
| 33% of all silviculture surveys | 242 |

**Optionally, you may provide a more exact estimate:**

| | |
|---|---|
| Estimate area of regen delay surveys | |
| Estimate area of free growing surveys | |
| Estimate area of pre-stand tending surveys | |
| Estimate of total surveys that will affect timber supply | (A) 0 |

Surveyed area that will affect timber supply
Replace with (A) if a more exact estimate is calculated 242

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)
Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002

# Boundary TSA
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 96 | 0 | 242 | 81 | 96 | 350 | 317 | 0 | 0 | 1,182 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 2,558 | 0 | 7,280 | 0 | 13,104 | 5,688 | 0 | 0 | 0 | | 28,630 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 0 | | | | | | | | 0 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 0 | | | | | | | | 0 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 10 | 0 | 24 | 81 | 192 | 914 | 1,255 | 0 | 0 | 118 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 0 | 1 | 5 | 7 | 0 | 0 | 1 | 14 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# Boundary TSA
## Management Unit Summary Table
## For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 300 | 550 | 1,050 | 550 | 1,050 | 500 | 150,000 |
| Planning, prescriptions and seedlings | | | | | | | 25,000 |
| Backlog Program Field Activities | 1,277 | 0 | 0 | 0 | 0 | 354 | 452,507 |
| Planning, prescriptions and seedlings | | | | | | | 76,000 |
| **Totals** | 1,577 | 550 | 1,050 | 550 | 1,050 | | 703,507 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 28,630 m$^3$ |
| Estimated ha that will be reclassified as stocked | 0 ha |
| Estimated ha that will be declared as free growing | 0 ha |
| Estimated total full time equivalent positions generated | 14 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

## Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement.
The template design allows completion in a consistent format for all management units across the province.
Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** Cranbrook TSA

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# Cranbrook TSA
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 500 | 0 | 0 | 0 | 0 | 25.00 | 12500 |
| Spacing | 160 | 0 | 0 | 0 | 0 | 600.00 | 96000 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 660 | 0 | 0 | 0 | 0 | 164.39 | 108,500 |
| Planning and prescriptions | | | | | | | 10,000 |
| **Total dollars** | | | | | | | 118,500 |
| **Forest Health Enhancement** | | | | | | | |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Habitat Supply and Biodiversity Enhancement** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Domestic Range** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Enhanced Forestry Activities - Management Unit Total** | | | | | | | |
| Surveys | 500 | 0 | 0 | 0 | 0 | 25.00 | 12,500 |
| Spacing | 160 | 0 | 0 | 0 | 0 | 600.00 | 96,000 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 660 | 0 | 0 | 0 | 0 | 164.39 | 108,500 |
| Planning and prescriptions | | | | | | | 10,000 |
| **Studies funding** | | | | | | | |
| **Total dollars** | | | | | | | 118,500 |

12/5/2005

# Cranbrook TSA
# Backlog Program Table
# For the 2001/02 Fiscal Year

| **Activities** | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Legal Obligations** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 516 | 0 | 0 | 0 | 0 | 450.00 | 232200 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 516 | 0 | 0 | 0 | 0 | 450.00 | 232,200 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 232,200 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 2000 | 0 | 0 | 0 | 0 | 25.00 | 50000 |
| Site preparation | 100 | 0 | 0 | 0 | 0 | 900.00 | 90000 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 2100 | 0 | 0 | 0 | 0 | 66.67 | 140,000 |
| Seed purchase | 75000 | 0 | 0 | 0 | 0 | 0.11 | 8,250 |
| Prescriptions and planning dollars | | | | | | | 10,000 |
| **Total backlog reforestation** | | | | | | | 158,250 |
| **Impeded areas** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 0 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation* (PFT)** | 50 | 0 | 0 | 0 | 0 | 1,400.00 | 70000 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 50 | 0 | 0 | 0 | 0 | 1,399.94 | 70,000 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 10,000 |
| **Total site restoration** | | | | | | | 80,000 |

**PFT or Problem Forest Type

| **Backlog Program Activities - Management Unit Total** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
|---|---|---|---|---|---|---|---|
| Surveys | 2000 | 0 | 0 | 0 | 0 | 25.00 | 50000 |
| Site preparation | 150 | 0 | 0 | 0 | 0 | 1,066.66 | 160000 |
| Planting | 516 | 0 | 0 | 0 | 0 | 450.00 | 232200 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 2666 | 0 | 0 | 0 | 0 | 165.87 | 442200 |
| Seed purchase | 75000 | 0 | 0 | 0 | 0 | 0.11 | 8250 |
| Prescriptions and planning | | | | | | | 20,000 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 470,450 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

12/5/2005

# Cranbrook TSA
# Backlog Program Table
# For the 2001/02 Fiscal Year

| **Activities** | **Treatment Area Goals (ha)** | | | | | **Plan 2001/02** | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| **Legal Obligations** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 516 | 0 | 0 | 0 | 0 | 450.00 | 232200 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 516 | 0 | 0 | 0 | 0 | 450.00 | 232,200 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 232,200 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 2000 | 0 | 0 | 0 | 0 | 25.00 | 50000 |
| Site preparation | 100 | 0 | 0 | 0 | 0 | 900.00 | 90000 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 2100 | 0 | 0 | 0 | 0 | 66.67 | 140,000 |
| Seed purchase | 75000 | 0 | 0 | 0 | 0 | 0.11 | 8,250 |
| Prescriptions and planning dollars | | | | | | | 10,000 |
| **Total backlog reforestation** | | | | | | | 158,250 |
| **Impeded areas** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 0 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation* (PFT)** | 50 | 0 | 0 | 0 | 0 | 1,400.00 | 70000 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 50 | 0 | 0 | 0 | 0 | 1,399.94 | 70,000 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 10,000 |
| **Total site restoration** | | | | | | | 80,000 |
| **PFT or Problem Forest Type | | | | | | | |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 2000 | 0 | 0 | 0 | 0 | 25.00 | 50000 |
| Site preparation | 150 | 0 | 0 | 0 | 0 | 1,066.66 | 160000 |
| Planting | 516 | 0 | 0 | 0 | 0 | 450.00 | 232200 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 2666 | 0 | 0 | 0 | 0 | 165.87 | 442200 |
| Seed purchase | 75000 | 0 | 0 | 0 | 0 | 0.11 | 8250 |
| Prescriptions and planning | | | | | | | 20,000 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 470,450 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

12/5/2005

**Cranbrook TSA**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

***The following default provincial factors may be replaced by management unit specific factors.***
The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

| | Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| **Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| **Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| **Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

***Area affected by tree improvement, seedling production and silviculture surveys***
Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys.

| | Area | | |
|---|---|---|---|
| | Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 516 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 516 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 500 |
| Total backlog surveys from the backlog table | | | 2,000 |
| 33% of all silviculture surveys | | | 825 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 825 |

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)
Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002

| Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize |
|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 |

**Years the factor will affect:**

| Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize |
|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| Space | Prune | Fertilize |
|---|---|---|
| 5-15% | 15-30% | 1-5% |

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.

The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys |
| **A Tree improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 516 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 516 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 500 |
| Total backlog surveys from the backlog table. | | | 2,000 |
| 33% of all silviculture surveys | | | 825 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | | (A) 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 825 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)<br>Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | |
| Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)<br>Estimate area that will be classified as free growing after a survey in 2001/2002 | | | |

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity.

## Cranbrook TSA
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 516 | 0 | 825 | 150 | 516 | 0 | 160 | 0 | 0 | 2,167 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 13,751 | 0 | 24,828 | 0 | 70,434 | 0 | 0 | 0 | 0 | | 109,014 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 0 | | | | | | | | 0 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 0 | | | | | | | | 0 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 52 | 0 | 83 | 150 | 1,032 | 0 | 634 | 0 | 0 | 217 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 1 | 6 | 0 | 4 | 0 | 0 | 1 | 12 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

Cranbrook TSA

## Management Unit Summary Table
## For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 660 | 0 | 0 | 0 | 0 | 164 | 108,500 |
| Planning, prescriptions and seedlings | | | | | | | 10,000 |
| Backlog Program Field Activities | 2,666 | 0 | 0 | 0 | 0 | 166 | 442,200 |
| Planning, prescriptions and seedlings | | | | | | | 28,250 |
| **Totals** | 3,326 | 0 | 0 | 0 | 0 | | 588,950 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 109,014 $m^3$ |
| Estimated ha that will be reclassified as stocked | 200 ha |
| Estimated ha that will be declared as free growing | 125 ha |
| Estimated total full time equivalent positions generated | 12 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

# Golden
# Timber Supply Area

## Interim Silviculture Strategy

-- Version 1.3 --

British Columbia
**Ministry of Forests**

**Funded By**

Forest Renewal BC

**March 31, 1999**

# Contents

STRATEGY AT A GLANCE ..... iii
Introduction ..... 1
  About the Interim Strategy ..... 1
  Methodology ..... 1
  Structure of This Document ..... 2
  Acknowledgments ..... 2
Basic Data ..... 3
  Land Area ..... 3
  AAC ..... 3
  Harvest Forecast ..... 3
  Site Class ..... 3
  Age Class ..... 3
  Tree Species ..... 3
Issue Analysis ..... 4
  Timber Quantity Issues ..... 4
  Timber Quality Issues ..... 12
    Available Information ..... 12
    Discussion ..... 12
    Silvicultural Opportunities ..... 13
  Illustration of Issues and Silvicultural Opportunities ..... 13
  Summary of Issues by Period ..... 17
    Short Term Harvest Forecast (1 - 20 years) ..... 17
    Mid Term Harvest Forecast (21 - 70 years) ..... 17
    Long Term Harvest Forecast (71 + years) ..... 18
    Potential for Change in the Shape of the Harvest Forecast ..... 19
    Future Timber Quality ..... 20
Incremental Silviculture History ..... 21
Higher Level Goals and Objectives ..... 22
  Provincial Goals ..... 22
  Provincial Objectives ..... 22
  Regional Objectives ..... 22
  Higher Level Plans ..... 22
Opportunities to Increase Timber Supply ..... 23
  Potential Silviculture Strategies ..... 23
    Short Term (1 - 20 yrs) ..... 23
    Mid Term (21 - 70 yrs) ..... 23
    Long Term (71+ yrs) ..... 24
  Workshop Review of Potential Strategies ..... 24
    Short Term (1 - 20 years) ..... 25
    Mid Term (21 - 70 years) ..... 27
    Long Term (71+ years) ..... 34
  Potential Harvest Forecast ..... 38
Opportunities to Improve Timber Quality ..... 41
  Product Objectives ..... 41
  Workshop Review of Potential Strategies ..... 42
  Large Premium Log Analysis ..... 43
  Potential Timber Quality Forecast ..... 46
Opportunities to Improve Habitat Supply ..... 47
  Workshop Review of Potential Strategies ..... 47
Silviculture Strategy ..... 50
  General Strategy ..... 50
  Working Targets ..... 50
  Log Product Objectives ..... 51
  Silviculture Strategies ..... 52
    Strategies to Increase the Quantity of Future Timber Supply ..... 52
    Strategies to Increase the *Quality* of Future Timber Supply ..... 53
    Strategies to Increase the *Quantity* or *Quality* of Future Habitat Supply ..... 53
  Summary of Information and Research Needs ..... 54
Silviculture Regimes and Investment Priorities 55
Silviculture Program ..... 56
Job Outcomes ..... 57
References ..... 58
Abbreviations ..... 59
Appendix A: Additional Document Detail ..... 60

# Figures

Figure 1. Current age class structure ..... 13
Figure 2. Sensitivity to a decrease in minimum ages ..... 14
Figure 3. Sensitivity to an increase in minimum ages and implications for timber quality management ..... 14
Figure 4. Satisfying older forest biodiversity requirements ..... 15
Figure 5. Changes in allowable disturbance in VQO zones ..... 15
Figure 6. Changes in existing stand volumes ..... 16
Figure 7. Changes in regenerated stand yields ..... 16
Figure 8. Changes in timber harvesting land base ..... 17
Figure 9. Potential harvest forecast, Golden TSA ..... 38
Figure 10. Expanded view of potential harvest forecast alternatives, Golden TSA ..... 39
Figure 11. Potential quality forecast, Golden TSA ..... 46
Figure 12. Combined potential quantity and quality harvest forecasts, Golden TSA ..... 51

# STRATEGY AT A GLANCE

### *General Strategy*

The primary focus of the silviculture strategy is to:

- increase regenerated stand volumes by 20%;
- accelerate the growth of stands currently aged 20-30 years to make them available for harvest at younger ages (i.e., at lower minimum harvest ages) in the period 60 to 80 years from now; and
- partially offset anticipated future lower log quality by spacing and pruning suitable young stands.

Accomplishing this strategy requires a program substantially above historic levels.

### *Working Targets*

WT 1 (Quantity): Minimize the anticipated interim reduction in timber supply so that harvest levels of at least 0.46 million m3/yr can be achieved in this period.

WT 2 (Quantity): Manage long term timber supply to yield a steady harvest level of 0.54 million m3/yr.

WT 3 (Quality): Manage regenerated stands to yield at least 9% (by volume) premium large logs as well as 3% (by volume) clear logs, with the majority of the remainder being of sawlog quality. (The majority of clear logs will also be large logs.)

### *Product Objectives*

The following are (unapproved) product objectives at the log level for the Golden TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | | |
| **Type III** | All | 15% of stands having 32.5+ cm minimum average stand diameter at breast height (DBH), having 60-100% of stems with a 1st log clear of knots, and achieved through faster growth at lower stocking levels (600 sph at rotation). |
| **Type IV** | All | 15% of stands having 32.5+ cm minimum average stand diameter at breast height (DBH), having narrow ring width achieved through higher stand density (800 sph at rotation) and having 60-100% of stems with a 1st log clear of knots. |
| **Sawlog:** | All | 27.5+ cm minimum average stand DBH. |

| *Major Silvicultural Strategies* | **Quantity and Quality of Timber Supply**<br>(Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Increase - increase over the second timber supply review (TSR2) base case. Maintain - maintain TSR2 base case) | *Priority Ranking* |
|---|---|---|
| General | Conduct silviculture surveys in support of all strategies. | 1 |
| LT1 | Maintain the THLB by: | |
| | (a) Fill-planting 300 ha of remaining treatable backlog NSR (maintain); and | 2 |
| | (b) Maintaining approx. 400 ha of previously reforested backlog plantations. (maintain) | 2 |
| Q1 | Two-lift prune 150 ha/yr (total 300 ha/yr) to 5.5 m to create knot-free timber in the lowest 5.0 m log. | 3 |
| Q2 | Space 350 ha/yr (in addition to MT3 spacing ) to obtain large dimension timber and prepare stands for fertilization, pruning and/or commercial thinning. | 3 |
| MT/LT 3 | (a) Reduce minimum harvest ages 10 years over the period 6 to 8 decades from now; and | |
| | (b) increase the volume of regenerated stands by 20% over those used at the base case minimum harvest age (LT impact); | |
| | through the following: | |
| | i) Expand the area planted with improved seedlings by 700 ha/yr - priority East Kootenay, mid-elevation lodgepole pine. (increase) | 2 |
| | v) Brush 400 ha/yr for growth enhancement and increased survival. (increase) | 4 |
| | vi) Space 350 ha/yr of dense stands (in addition to Q2 spacing) primarily in the Sue fire and Beaverfoot Valley areas to make them harvestable during the period 7 to 8 decades from now, overcoming an age class gap. (increase) | 3 |
| | vii) Manage 30 000 ha on a 15 yr return fertilization cycle of 2 000 ha/yr. | 6 |
| ST/MT 2 | Fertilize 450 ha/yr of suitable stands scheduled for harvest in the 2nd or later decades. (increase) | 5 |
| LT4 | Reduce losses to root rot by: (maintain) | |
| | (a) planting alternate species; | Current Practice |
| | (b) pop-up spacing (20 ha/yr); | ? |
| | (c) pushover logging / stumping; and | Current Practice |
| | (d) mixed species planting. | Current Practice |

*Major Silvicultural Strategies*

## Quantity and Quality of Habitat Supply

*Priority Ranking*

(Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness.)

To be completed.

*Incremental Silviculture Program*

*(ha)*

| Year | Surveys* | Fill Planting | Backlog Brushing | Brushing (for Growth) | Space | Prune | Fertilize |
|---|---|---|---|---|---|---|---|
| 1 | 8,000 | 300 | 300 | 400 | 700 | 300 | 2,450 |
| 2 | 8,000 | - | 300 | 400 | 700 | 300 | 2,450 |
| 3 | 8,000 | - | 200 | 400 | 700 | 300 | 2,450 |
| 4 | 8,000 | - | 200 | 400 | 700 | 300 | 2,450 |
| 5 | 8,000 | - | 100 | 400 | 700 | 300 | 2,450 |
| Subtot Yr 1 - 5 | 40,000 | 300 | 1,100 | 2,000 | 3,500 | 1,500 | 12,250 |
| 6 - 10 | 40,000 | - | - | 2,000 | 3,500 | 1,500 | 12,250 |
| Total Yr 1 - 10 | 80,000 | 300 | 1,100 | 4,000 | 7,000 | 3,000 | 24,500 |

* Includes prescription and layout

Some activities under this program are substantially above current levels and may have to be phased in over time. Spacing and fertilization are shown at approximate maximum levels. The regime table (page 55) indicates investment priorities.

*Information and Research Needs*

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for a silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 24).

1. Analysis of how much area is presently below green-up and time until green-up is required by landscape unit/resource management zone. (ST1)

2. Fertilization trials are needed in spruce and cedar stands to determine efficacy. (ST2)

3. Analysis required of the potential of recent plantations for future commercial thinning in the VQ zone (MT1).

4. TIPSY OAF 1 factor of 15% requires confirmation with respect to non-productive openings that are not typed out of forest stands, and with respect to basic brushing and brushing for growth. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (MT3 ii, v)

5. Assessment required of the 28 000 ha of stands aged 20-30 years as to what stocking levels will postpone the time to achieve the minimum piece size criteria (i.e., determine stocking threshold levels for spacing), and the occurrence of these stands (MT 3 vi).

6. FSSIM analysis is required to determine possible timber supply effect of lowering

ages for caribou habitat from 250 to 200. (MT4)

7. Silvicultural activities, particularly commercial thinning, can be used to create old-growth tree attributes at earlier ages, thereby relieving some constraints. However, some other biological requirements may not be met. Further study is required to determine if CT can achieve these attributes earlier. (MT4)
8. Further analysis of options and opportunities for dealing with non-merchantable hemlock is required before a course of action can be selected. (LT2)
9. An expert inventory of low-site stands similar to the Merritt small wood study is needed to determine their true productivity and silvicultural opportunities, if any. (LT2)
10. Further study of root rot management techniques and options is needed. (LT4)
11. Old growth site index estimation studies require completion. It is anticipated that site indexes may be underestimated.
12. Need to determine whether it is more cost effective to prune more hectares, but less stems per hectare than to prune all stems on fewer hectares. (Q1)
13. Greater certainty regarding the timber harvesting land base is critical - resolve issues such as operability and ESA1 occurrence - before large pruning investments can be made. (Q1)

# Introduction

## About the Interim Strategy

This strategy, and the process on which it is founded, is intended to help optimize the application of available funding for silviculture activities towards the goals of improving the future quantity and quality of both habitat and timber supply. The strategy will be considered as one of several inputs in decisions on funding allocations and treatment activities.

The limitations of time, budget and available information have tended to cause the focus in this first version of the strategy to be on the future quantity of the timber resource. It is expected that as the strategy development process evolves and as better and more information becomes available, the strategy will have more regard to the matters of future timber quality and the future quantity and quality of habitat supply.

To achieve the optimization objective, the opportunity evaluation process recorded herein is not limited by factors such as the availability of funding, funding source (e.g., public vs. private), or the ability to deliver a program. Because of this, the strategy generally illustrates the plausible high end of the potential of the timber resource. Within this context as well as a broad context of cost-effectiveness, available treatment opportunities, and operational realities -- all of which were explored in general terms in the workshop -- potential treatment activities are ranked. The end result hopefully points to the most effective and efficient means of at least partially achieving the working targets. The degree to which the overall strategy ultimately prove appropriate and is achieved will ultimately be the degree to which the expressed targets will also be achieved. This, of course, could also be affected by future unknowns, such as major changes in forest policy, land base available for timber production, or market demand.

Although this strategy focuses primarily on silviculture, it is recognized that silviculture is part of a suite of potential strategies which together may influence the future quality and quantity of habitat and timber supply.

This strategy should not be confused with the allowable annual cut (AAC)[1] determination process. AAC's are based on actual practice and current information at the time of the determination. This strategy, on the other hand, is about creating a future state of our forests. Again, the degree to which the strategy proves appropriate and is achieved may influence future, but not necessarily present, AAC determinations.

This strategy is founded on readily available information and the knowledge of forestry professionals. It is intended as an interim strategy until a more in-depth analysis-based review is completed.

## Methodology

This strategy was prepared through the following process:

1. A silviculture strategy demonstration workshop was held November 26 & 27, 1998 in Revelstoke, using the Golden Timber Supply Area (TSA) as a case study. The workshop was attended by licensee representatives from both inside and outside the Golden TSA. Prior to the workshop, L. P. Atherton & Associates prepared a preliminary draft of this document, summa-

---

[1] See "Abbreviations," page 59 for a full listing of abbreviations used.

rizing all available information relevant to a strategy and identifying opportunities to improve the future quantity and quality of timber supply. Larry Atherton of L. P. Atherton & Associates and Doug Williams of Cortex Consultants Inc. led the session. The preliminary strategy document was revised to reflect the outcome of the demonstration workshop.

2. Because few persons attending the demonstration workshop had first-hand knowledge of the TSA a second district workshop was held March 2 &3, 1999 in Golden, attended by representatives of the MoF, MoELP and forest licensees of the Golden Timber Supply Area (TSA). The workshop was led by the same team as the first demonstration workshop. Participants reviewed the potential opportunities identified in the revised draft document along with others that arose. The outcome of the session was a regime table, complete with priorities.
3. The consultants incorporated the results of the workshop into a revised draft document (version 1.2) and added forecasts of future harvest quantity and quality and of job outcomes.
4. Version 1.2 was submitted to the Ministry of Forests for review. Version 1.3 was prepared in response to client comment and resubmitted. (The ministry may assign higher version numbers (e.g., 1.4, 1.5, etc.) as the strategy evolves and changes are made.)

## Structure of This Document

This document generally reflects the flow of the above methodology, that is, pre-workshop preparation (the earlier demonstration workshop is considered to be part of pre-workshop preparation), workshop findings and outcomes, and post-workshop analysis and review. A key objective of the process is to have a documented rationale to the strategy. Maintaining the thread of documentation throughout the process (i.e., from issue analysis through to final adopted strategy) is important to this objective, but is occasionally achieved at the cost of clarity and ease of reading. If needed, a table is included in the appendices which contains additional documentation on the process through which this document was developed.

## Acknowledgments

The participation of representatives of the following organizations at the district workshop is gratefully acknowledged.

*Ministry of Forests:*

- Columbia Forest District
- Nelson Forest Region

*Ministry of Environment, Lands & Parks:*

- Habitat Protection

*Forest licensees of the Golden TSA:*

- Evans Forest Products Ltd
-

The project was directly managed by Ivan Listar of the Ministry of Forests, Nelson Forest Region. Funding was provided by Forest Renewal BC under a contract between the Ministry of Forests, Victoria (administered by Ralph Winter, Forest Practices Branch) and Cortex Consultants, Inc.

# Basic Data

## Land Area

| Description | Area (ha) | Area % |
|---|---|---|
| Total Area of TSA | 893 400 | 100 |
| Total Productive Crown Forest | 295 800 | 33 |
| Net Timber Harv. Land Base | 166 600* | 19 |

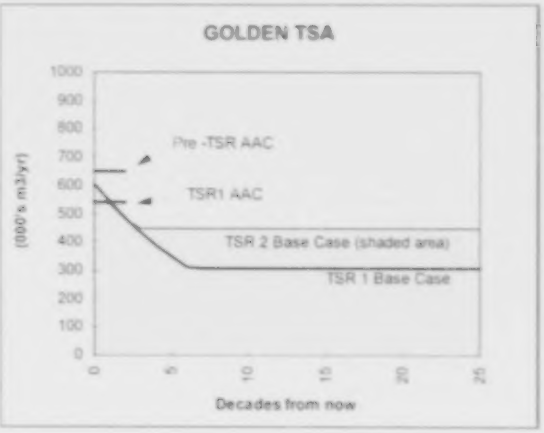
Source: TSR2 analysis report - rounded to nearest 100 ha.
*TSR1 net THLB - 174 600 ha.

## AAC

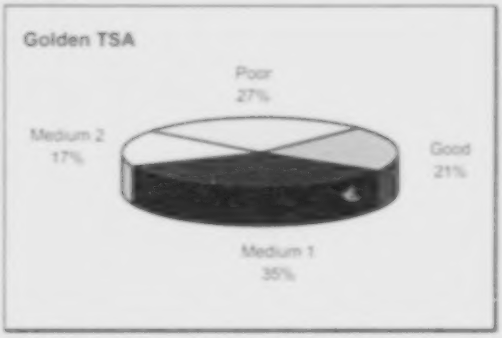
| AAC Type | Pre-TSR | TSR1* | Change (%) |
|---|---|---|---|
| Conventional | 650 000 | 540 000 | -16.9 |
| Deciduous | - | - | |
| Insect/Disease | - | - | |
| Marginal | - | - | |
| Total | 650 000 | 540 000 | -16.9 |
| Woodlot AAC | included in conventional AAC | 5 000 | |

*effective January 1/95

## Harvest Forecast

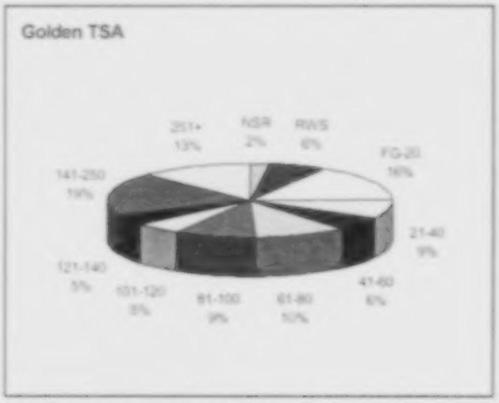


## Site Class



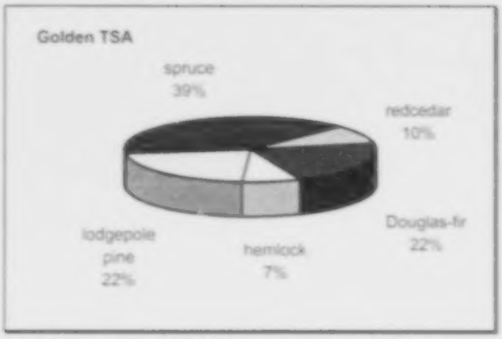
THLB only. Source:TSR2 analysis report - Fig 4.

## Age Class



THLB only. Source:TSR2 analysis report - Fig 5 (scaled). #'s require confirmation.

## Tree Species



THLB only. Source: TSR2 analysis report Fig. 3b.

# *Issue Analysis*

## Timber Quantity Issues

The following information is primarily from documentation produced under the second timber supply review, or TSR2. Sources are noted, with full references given on page 58. Only information which is relevant to a silviculture strategy is recorded. Key statements are bolded.

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| ♦ Harvest Forecast | The initial harvest level of 535 000 m3/yr (TSR1 AAC less 5 000 m3/yr for woodlots) can be maintained for 2 decades, followed by successive decadal declines of 10% and 7% over 2 decades to a long term harvest level of 446 000 m3/yr (17% below the TSR1 AAC) reached at the start of decade 4. (TSR2 report, 25)<br>The first regenerated stands become available for harvest after 5 to 6 decades. In decade 7, almost no high volume older stands are available for harvesting and the harvest comes almost exclusively from lower volume regenerated stands on poor-quality sites that have just reached min harvest age. After decade 7 more regenerated stands on higher quality sites are available resulting in an increase in the average vol/ha harvested. | First regenerated stands being on poor site appears illogical. Usually the better sites were harvested first. May be a matter of access. | Can the first of the regenerated stands be made available sooner through spacing & fertilization? Is spacing assumed in the yield tables? Or would larger volumes at min ages be a greater benefit? | |
| ♦ Age Class | Approximately 31% of stands in the timber harvesting land base (THLB) are 30 years or younger, 29% are between 31 and 100 years old, 6% between 101 and 140 years old, and 34% older than 140 years. Almost 56% of stands are at or above their min harvestable ages and a large portion of stands presently aged between 60 - 100 yrs will reach min harvestable age in the short term. (TSR2 report, 16)<br>Inoperable and operable excluded forests are aged but not regenerated. In 200 years the bulk of them are aged over 400 yrs with virtually none below 200 years of age (TSR2 report, Fig 13, 32). After 4 decades the inoperable stands meet most wildlife habitat requirements for the analysis area (TSR2 report, 31). This will likely overestimate the long term timber supply (TSR2 report, 47). (see bio- | Overall, stands in the TSA are relatively young. Few stands aged 101 to 140 results in fairly rapid transition to 2nd growth by 6th decade.<br>Chief forester (CF) found age class distribution to be not a limiting factor in TSR1 AAC determination. | | |

| Issue | Description | Discussion | Silvicultural Opportunities<br>Increase Over Base Case | Silvicultural Opportunities<br>Maintain Base Case |
|---|---|---|---|---|
| | diversity) | | | |
| ◆ Silvicultural Systems | Silvicultural systems not explicitly stated. A recent review of harvesting shows that 99% of the THLB is currently managed under a clearcut harvesting system. Table A-20 (TSR 2 analysis report[2], 116-117) indicates all areas are planted with a 2 yr regen delay. | | | |
| ◆ Backlog NSR | Proportion of not satisfactorily restocked (NSR) area that is backlog is unspecified. All area was included in analysis. (TSR2 report, 118-119) | TSR1 reported 5 200 ha of operable backlog NSR. To be restocked in five years. | | Failure to rehabilitate would result in a lower base case forecast. |
| ◆ Land Base | • 10 629 ha of deciduous stands (equiv to 6% of THLB) deducted from THLB (TSR2 report, 10).<br>• 2 114 ha (equiv to 1% of THLB) of low productivity forest types deducted from THLB. Subsequent analysis indicates a further 7 583 ha of younger stands (equiv to 4.5% of THLB) do not meet the volume cut-off requirements when grown to maturity (i.e., SB mix or Cw not reaching 200 m3/ha by age 200, and other species and pure S not reaching 150 m3/ha by ages between 150 to 250). (TSR2 report, 102)<br>• 2 090 ha (equiv to 1% of THLB) of brush deducted from THLB. (TSR2 report, 10)<br>• 1 255 ha (equiv to 0.5% of THLB) of hemlock leading stands or balsam-hemlock stands greater than 140 years of age deducted from THLB as non-merchantable (TSR2 report, 102.<br>Sensitivity test ± 10% of THLB. Area in all stand types and ages both increased and decreased. (TSR2 report, 57)<br>Decrease: (-10%) Area removed considered inoperable, ∴ still contributes to meeting forest cover requirements. **Very sensitive.** Initial harvest level must start 2% below base case. Same rate of decline as base case to long term har- | THLB in the base case appears over-estimated by 4.5% due to under-estimation of low-site stand area. Impact on LTHL likely in the 2-3% range due to the very low volumes contributed by these stands.<br>In TSR1 AAC rationale, CF concluded there was no opportunity to consider establishing a partitioned AAC for the purpose of harvesting in traditionally inoperable areas. | Rehabilitate/convert deciduous (often in riparian areas) and/or non-merch types?<br>Fertilize low productivity stands? | |

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[2] Hereafter referenced as TSR2 report.

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | vest level **(LTHL) 10% lower than base case**.<br>Increase: (+10%) Additional area assumed to come from inoperable. Very sensitive - initial harvest level can be maintained 2 decades longer than base case (4 vs 2). **LTHL 9% above base case**. | | | |
| ◆ Forest Cover | *Wildlife, Watershed & Integrated Resource Management (IRM) Zones*: 41%, 2%, and 50% of THLB and 51%, 4% and 48% of operable land base respectively (TSR2 report, 19-20). Base case requirement of at most 25% of the operable land base permitted to be < green-up ht (2 m in wildlife/IRM zones, 6m in watershed zone (TSR2 report, 110)).<br>Currently about 20% of operable area is < 20 yrs old. Changing the allowable level to 20% (from 25%) causes some reduction but harvesting can occur in several zones and timber supply is not severely restricted. Increasing the constraint to 15% results in an immediate reduction in harvest levels as several management zones cannot be harvested in the short term. (TSR2 report, 38-39)<br>**Area currently not greened up is likely underestimated.** Approx. 1 400 ha of NSR is older than 20 yrs but was effectively treated by the model as greened up due to age (TSR2 report, 118).<br>Sensitivity tests of ± 5, ± 10% of area allowed to be not greened up. (TSR2 report, 38-39)<br>Relax Constraint: (+5% to 30%) Short term insensitive. Transition to LTHL one decade longer than base case (4th decade same level as 3rd). LTHL 3% higher than base case.<br>(+10% to 35%) **Same result as a 5% reduction.**<br>Increase Constraint: (-5% to 20%) Moderately sensitive - initial harvest level (IHL) can only be maintained 1 decade, LTHL 4% below base case.<br>(-10% to 15%) **Highly sensitive** - IHL deceased 19% below base case. LTHL 6% below base case. | The constraint threshold is somewhere between 25 - 30% of area not greened up. Relaxing the constraint beyond the threshold will not increase timber supply because other constraints then become limiting.<br>TSR1 reports both the small business forest enterprise program (SBFEP) and the major licensee are having trouble finding suitable and available wood to meet planning requirements. | Role for commercial thinning (CT)?<br>Harvesting timber using partial harvesting or CT methods has the effect of "relaxing" the constraint. (Mid Term (MT), Long Term (LT)) | The short term harvest level is at serious risk should there be a substantial increase in forest cover constraints (FCC's) anytime over the next 30 yrs. Accelerating growth of young existing stands to achieve earlier green-up would serve to reduce this risk. (Short Term (ST)) |

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| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | *Visual Quality Zones*: Retention - 13% of THLB and of operable land base (OLB). Base case requirement of at most 15% (partial retention visual quality objective (VQO)) to be < 6 m tall (TSR2 report, 20). Only 20 ha considered to have retention VQO, so is lumped with partial retention (TSR2 report, 47).<br>Sensitivity test of ± 10%. (TSR2 report, 47-48)<br>Relax Constraint: (+10% to 25% - same as IRM) Slight sensitivity. Allows initial harvest level to be maintained 3 decades (vs base case 2). 4th decade harvest level is 7% higher than the base case. LTHL 1% higher.<br>Increase Constraint: (-10% to 5%) Moderately sensitive - initial harvest level can be maintained only 1 decade. **LTHL 9% below base case**. | This is the only management zone in which harvesting is consistently limited by the forest cover requirements in the base case (TSR2 report, 48). | Increasing harvests from the VQ zones offers potential to have higher harvests in decade 3 onwards. Two avenues: CT to increase vol. or brush/fertilize regen stands to reach 6m green-up sooner. (MT, LT) | The short term harvest level is at risk only were there a severe increase in constraint. Such an increase is not likely. |
| | *Green-up*: green-up is a combination of green-up age and regen delay (TSR2 report, 39). Green-up ages range from 11-26 yrs for 2m ht and from 21-42 yrs for 6m ht (TSR2 report, 100). Regen delay is 2 yrs (TSR2 report, 116-117).<br>Sensitivity test of ± 5 years. (TSR2 report, 39-40)<br>Relaxation of constraint: (- 5 yrs) Insensitive over short and mid term. LTHL 2% higher than base case due to a small increase in the availability of timber, particularly in the VQ and watershed zones.<br>Increase Constraint: (+ 5 yrs) Moderately sensitive - initial harvest level 1% below base case and can only be maintained for 1 decade. 2nd and 3rd decade harvests significantly below base case. LTHL 1% lower. | | Targeting reduction in time until green-up in VQ and watershed zones (both have 6m ht reqmts) offers potential to increase LTHL 2%. (LT) | Ages used are not likely under-estimated. Not a concern. |
| | *Ungulate Winter Range*: (27% of THLB) Base case modeled on basis that at all times and for every landscape unit, at least 40% must be in stands 100 yrs or older and no more than 25% in stands less than 2 m tall. However, actual guideline is to maintain at least 40% of mature forest cover in every 250 ha patch.<br>Sensitivity test of applying the mature cover guideline in 250 ha patches and allowing a max of 15% or 35% (± 10% from base case) of the area within 250 ha patches to be disturbed (i.e., to be below green-up age). (TSR2 report, 40-42)<br>35% allowed to be disturbed: Insensitive over short and mid term. LTHL | Basically insensitive to modelling actual constraint. | | |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | 1.5% lower than base case. The smaller winter range units require more of the THLB to meet cover requirements than the base case, and thus extends harvest age in each unit beyond that of the base case.<br>15% allowed to be disturbed: Moderately sensitive - initial harvest level can only be maintained for 1 decade because there is not enough timber available in other zones to compensate for the lowered limit. LTHL 1.5% lower. | | | |
| ◆ Bio-diversity | *Landscape Level Old-Seral*<br>Base case gradually applies low-emphasis portion of old-seral requirements over a 140 year period. Sensitivity test of application in full at the beginning of the planning horizon. Result is that IHL can be maintained for only 1 decade vs 2 in the base case. Requirements must be met in part from stands within the THLB. After 4 decades most of the requirement can be met by stands from outside the THLB, therefore LTHL does not change. Application of the old-seral requirement to the operable land base to ensure full representation of all biogeoclimatic variants yields the same sensitivity result, except the LTHL is slightly below the base case. (TSR2 report, 42-43) | See "Age Class" above, "Biodiversity contribution from areas outside the THLB" below. | | Use CT to create old-seral stand structures at earlier ages? Not likely effective by 2nd decade. |
| | *Biodiversity Emphasis Options*<br>Base case used average, area weighted proportions of old growth that would be retained to meet biodiversity emphasis targets and applied this average to each landscape unit. Sensitivity test of applying the old growth requirements to each landscape unit individually. Initial harvest level can be maintained only one decade, one less than the base case. LTHL is unchanged. (TSR2 report, 44-45) | Little difference between methodologies. | | |
| | *Combined Full Old-Seral and Biodiversity Emphasis Options*<br>Applying the above two constraints at the same time results in an **immediate 5% reduction in the IHL**. LTHL 2% below base case. (TSR2 report, 45) | | | |
| | *Biodiversity contribution from areas outside the THLB*<br>When parks are excluded from the analysis area, the IHL can only be maintained for 1 decade (vs 2 in the base case) and LTHL is about 1% lower. More of the | Not regenerating stands in the OLB likely overestimates the timber supply. | | Use CT to create old-seral stand structures at earlier ages. (MT, |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | biodiversity requirements must be met from within the THLB which reduces the available timber supply.<br>When the current age class distribution of forests outside the THLB is held constant the IHL must drop 5% below the base case and LTHL is about **10% lower**, due to the increased need to use stands within the THLB to meet seral stage requirements. The base case assumption that there will be no creation of young stands in forests outside the THLB does not likely represent the future distribution of the land base and **will likely overestimate the long term timber supply**. (TSR2 report, 46-47) | | | LT)<br>As forested areas outside of the THLB are damaged they may revert to NSR for long time periods. For those areas outside of parks, would it be of long term benefit to consider stocking establishment? (LT) |
| ◆ Min. Harvest Ages | Base case uses ages based on: age at which stands reach a min vol/ha (150 m3/ha for F, S, Pl or 200 m3/ha for C, H); age to a min. 25cm dia.; age that is 90% of culmination age; and professional judgment. Selected min. ages range from 70 - 170 yrs for existing stands and from 60 - 170 yrs for regenerated stands. (TSR2 report, 106-108)<br>Sensitivity analyses of ± 10 yrs and ±20 yrs. (TSR2 report, 49-51) **Very sensitive.**<br>Decrease: (- 10 yrs) **IHL is extended 3 decades longer** than the base case (5 vs 2) followed by a decline of 10%/decade until LTHL reached at start of decade 10. **LTHL 7% below base case**, presumably due to stands being harvested before reaching culmination age.<br>Decrease: (- 20 yrs) IHL is extended 4 decades longer than the base case (6 vs 2) followed by a decline of 10%/decade until LTHL reached at start of decade 8. **LTHL 16% below base case**, presumably due to stands being harvested before reaching culmination age.<br>Increase: (+10 yrs - alternative 1) IHL can be maintained only 1 decade. Timber supply in the transition period is substantially reduced, necessitating a | Base case min ages appear close to culmination age as LTHL shows sensitivity to changes. TSA shows more sensitivity than other TSA's - there may be some other factors at work as well.<br>Increasing volumes at the same minimum age would be same as increasing regen stand vol's & will result in higher LTHL.<br>Base case use of TIPSY assumes stocking control at approx 1 200 st/ha (density used is not stated). Legal requirements for basic spacing do no kick in until 10 | There is a potential for a trade-off between increasing volumes of regenerated stands and reducing min ages. Target sharing of these effects; e.g., lower min ages 5 yrs (allowing maintenance of IHL for 1 more decade) and increase regen volumes 10%? (MT, LT) | If trees in fact take 10 yrs longer to grow to min. sizes and volumes than at the ages used in the base case, the IHL can only be maintained 1 decade and there will be a 5% shortfall below the base case LTHL lasting until 110 years from now. Programs of spacing and fertilization would help ensure the sizes |

| Issue | Description | Discussion | Silvicultural Opportunities | |
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| | | | Increase Over Base Case | Maintain Base Case |
| | **5% shortfall below the LTHL** and the transition period is extended to the end of the 11th decade. (This shortfall may not exist if LTHL proves over-estimated.) Regenerating stands, which are critical to timber supply during the transition of harvesting from old growth to second growth, must age an additional decade before they are considered merchantable. Some existing stands must be held longer to avoid even more serious timber supply disruptions.<br>Increase: (+20 yrs) **Very sensitive**. IHL must be immediately reduced 5% below base case. A mid term shortfall 11% below the base case occurs, lasting until the end of the 11th decade. LTHL is 4% above base case Short term highly sensitive 21% below base case. Insensitive mid term. | 000 st/ha. There must therefore be an incremental spacing program to control stocking or it is likely that stands will not reach the minimum diameter requirements at the base case minimum ages. | | assumed in the forecast are attained. (ST, MT, LT) |
| ♦ Timber Volume Estimates | Variable Density Yield Projection (VDYP) system used for existing stands older than 20 years. Table Interpolation Program for Stand Yields (TIPSY) used for all regenerated stands and existing stands aged 20 or less. (TSR2 report, 18)<br>*Existing stand volumes*:<br>Sensitivity test for ± 10% in volume. **Short term highly sensitive**. Long term insensitive to either increase or decrease. (TSR2 report, 51-52)<br>Increase: (+10%) IHL can be maintained 5 decades, 3 longer than the base case. Harvest level then drops 10% and is held at this level for 3 decades (vs 1 in the base case). LTHL unchanged.<br>Decrease: (-10% - alternative 1) **Highly sensitive**. IHL can only be maintained 1 decade before falling to a shortfall level 10% below the LTHL, rising to LTHL at the end of decade 10. | Very sensitive.<br>A recently completed inventory audit indicates that the volume estimates used are reasonably accurate (TSR2 report, 52). | Increasing vol's of existing stands would enable extending current harvest levels. (ST, MT) | Increasing vol's of existing stands would prevent substantial short and mid term reductions if volumes prove overestimated. (ST, MT) |
| | *Regenerated stand volumes*: TIPSY operational adjustment factor 1 (OAF1) - 15%; OAF 2 - 5%, Concern OAF2 underestimates losses on some stands to root disease. (TSR2 report, 115-118). Sensitivity tests indicate TIPSY yields raise LTHL 35% over VDYP yields for regenerated stands. (TSR2 report, 54)<br>Sensitivity tests for ± 10% in volume. Short term insensitive to either. **Highly sensitive to both in long term**. (TSR2 report, 52-53) | No indication of whether improved seed is used and factored into regen volume estimates. Assume not.<br>Challenge is to move volumes forward to fill mid- | Possibilities to increase regen vol's:<br>• Improved seed.<br>• Larger planting stock. | Management for root rot to limit losses to 5%. (LT) |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | Increase: (+10%) Short and mid term insensitive. LTHL 10% higher than base case, starting at the beginning of decade 8. Creates a mid term shortfall during decades 4-7.<br>Decrease: (-10%) LTHL 10% below base case. Extends IHL 1 decade because less volume must be held over the transition period due to lower LTHL. | term shortfall - see min harvest ages. (However, this shortfall may not exist if LTHL proves over-estimated.)<br>TSR1 reported armillaria root rot is assumed to be present in most stands. May reduce yields in some regenerated stands by 20%. This may prolong greenup or create gaps in free growing stands. | • Reduce voids (OAF1).<br>• Fertilization at planting.<br>• Brushing for growth.<br>(LT) | |
| ◆ Site Productivity | Site indexes may be under or over-estimated. Site index change simulated by changing regen stand volumes based on ±2.5 m site index (SI), and changing minimum harvest ages ± 10 yrs. Green-up ages unchanged. (TSR2 report, 55-56).<br>SI underestimated: (increase SI 2.5 m) Extends IHL 1 decade longer than base case (3 vs 2). Drops 10% after 3rd decade to an LTHL 8% above base case.<br>SI overestimated: (decrease SI 2.5 m) Short term insensitive. **LTHL 12% below base case.** | | | Consequences of SI being overestimated are severe in the long term. Need to determine accuracy of estimates & design silv. strategy accordingly. |

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## Timber Quality Issues

The timber supply review does not address the future quality of the timber resource. However, the review presents some information on harvested stand ages, which can be used as a broad surrogate for timber quality. Within limits, the older the stand the higher the timber quality.

### Available Information

The average harvested age over time is projected to decline in the next 60 years from an initial average of 280 years to 102 years. From decade 6 onwards most of the harvested stands are regenerated stands that have only recently reached minimum harvest ages. Their average harvested age is about 107 years. (TSR2 report, 30)

Changes to minimum harvest ages have a substantial impact on the harvest forecast (see Timber Quantity Issues - Min. Harvest Ages above, Figure 2 and Figure 3 below).

The TSR2 base case harvest forecast relied substantially on areas outside the THLB to meet old-seral biodiversity requirements. There is some uncertainty about this being the case. A sensitivity analysis demonstrated that requiring more old-seral stands to be within the THLB would substantially reduce the harvest forecast. (TSR2 report, 46) This has implications for improved timber quality which are discussed below.

### Discussion

Harvesting future stands at or near minimum ages indicates future timber quality will be much lower than today's. Timber will be of much smaller diameter, stem taper will tend to be greater, ring widths will be wider, there will be more juvenile wood content and there will be little clear wood.

Because lowering minimum ages 10 years enables extending the current harvest level a further 3 decades, timber quantity strategies will focus on lowering minimum ages, with the potential to further lower the overall quality of the timber resource (unless lower ages are compensated by strategies to ensure average tree sizes are maintained).

Requiring more of the old-seral biodiversity requirement to be met from within the THLB would lengthen the harvest ages of some stands considerably. This would increase the average quality content of future harvests when some of these areas are harvested. However, these stands may tend to occupy poorer quality growing sites, and once set aside for the purpose of providing old-seral biodiversity, may be held for great lengths of time. Tracking these stands through modeling would help improve understanding of the implications of different management scenarios on the future harvest quality profile.

There is some riskiness to maintaining a strictly volume-oriented focus at the expense of overall quality. Future markets must be such that a full diet of small diameter wood can be profitable. Secondary manufacturing opportunities, as well as manufacturing of very high quality products will become more limited.

The dilemma presented is choosing between volume and value. **However, some choices do not necessarily have to be made today**. Stand spacing can be performed now for the benefit of reducing minimum ages or for increasing stand value. Future markets and forest management policies will decide the ultimate allocation between quantity and quality. More attention likely is required for pruning decisions. Here, there will be trade-offs between potential log value, which could potentially increase with more time to add a larger clear-wood jacket, and earliest harvest to recover the pruning investment, which is more commensurate with timber quantity goals.

Modeling is required to have a better grasp of future timber quality scenarios.

- **Silvicultural Opportunities**

Pruning stands can develop a clear wood component to future harvests. Spacing can be used to increase the average diameters of some stands (this would also be a strategy, however, for enabling harvesting at younger ages).

## Illustration of Issues and Silvicultural Opportunities

TSA modelling in support of planning for silviculture has not yet been undertaken. In its absence, sensitivity analyses from the TSR2 analysis report are the best source of information as to the opportunities for silviculture to increase future timber supply. These opportunities are identified in the "Issue Analysis" section, which starts on page 4. The following are selected sensitivity analsysis charts from the TSR2 analysis report. Detailed analyses are required to confirm the indicated effects.

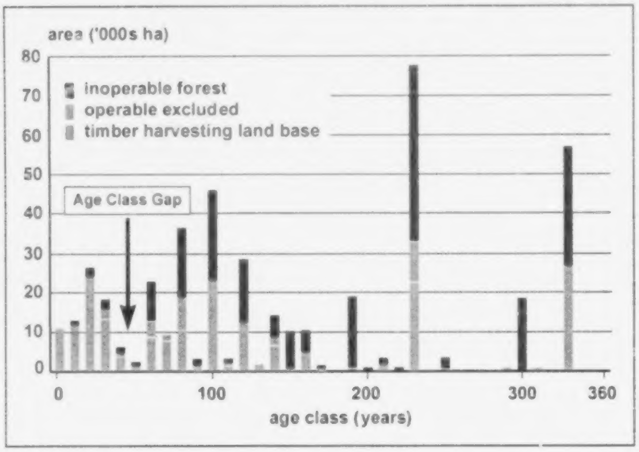

**Figure 1. Current age class structure**

*There is a shortage of stands currently in age classes 40 and 50 years. In 30 years from now, these stands will be 70 - 80 years of age, which is still below the base case minimum harvest age. Lowering minimum ages makes these stands immediately available, enabling the initial harvest level to be extended at least 2 more decades than in the base case. See Figure 2 below.*

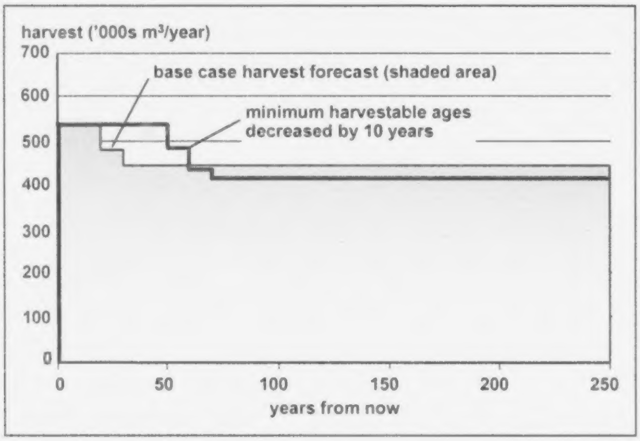

Figure 2. Sensitivity to a decrease in minimum ages

*Decreasing minimum ages 10 years extends the current harvest level by 3 decades. However, the long term harvest level goes down, because minimum ages become well below culmination ages; not allowing the growing potential of the land to be realized. During the district workshop, this sensitivity was found to be related to an age class gap (see Figure 1, above). Silvicultural strategies may be employed to overcome this gap. Lower minimum ages many not be required over all time periods, thus avoiding a reduced LTHL.*

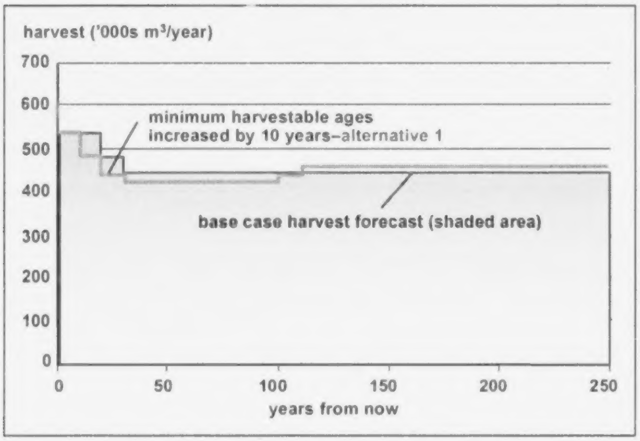

Figure 3. Sensitivity to an increase in minimum ages and implications for timber quality management

*Growing forests longer for quality purposes has harvest forecast implications over all terms. A 10 year increase in minimum harvestable ages lowers short and mid term harvest levels because this exacerbates the age class gap discussed above.*

*In the long term, quality and quantity goals are more compatible. Raising minimum ages results in stands being harvested closer to culmination and therefore at higher rates of productivity. Timber quality will also improve at these older harvest ages.*

*A 20 year increase in minimum ages (not shown) lowers short and mid term harvest levels further still, but does not significantly change the long term forecast from that of a 10 year increase in ages.*

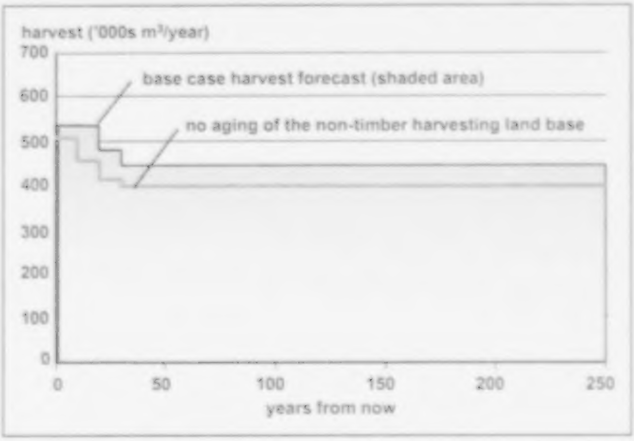

**Figure 4. Satisfying older forest biodiversity requirements**

*Much of the biodiversity requirement for older forests can be met from outside the timber harvesting land base. However, the modeling did not age and replace these forests. At the end of the planning period all stands outside the THLB 004. In-sample average pricing errors obtained with the equilibrium-based he older forest requirement must be met from within the THLB. This results in lower harvest levels across all periods. Silviculture practices can be used to create older forest attributes sooner, satisfying some of the requirements and allowing a higher harvest level than otherwise possible under this scenario.*

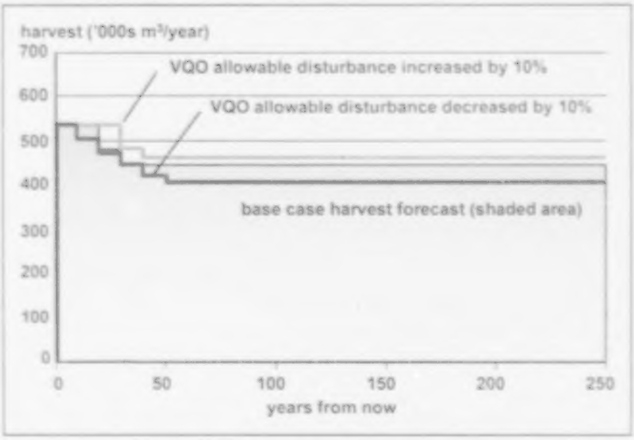

**Figure 5. Changes in allowable disturbance in VQO zones**

*Although the VQO zone is only 13% of the THLB, the high VQO constraints heavily restrict harvest levels in the base case. Commercial thinning or partial harvesting may allow some harvesting in otherwise restricted areas. Silvicultural practices can be employed to accelerate green-up of harvested areas.*

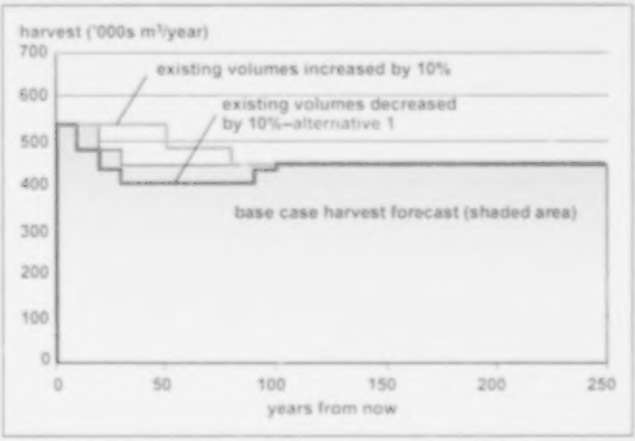

Figure 6. Changes in existing stand volumes

*An inventory audit confirms inventory volumes are statistically accurate. Otherwise, harvest levels would drop dramatically if existing stand volumes were overestimated. Fertilization of existing suitable stands could increase their volumes. If sufficient area could be treated, the initial harvest level could be maintained further into the future.*

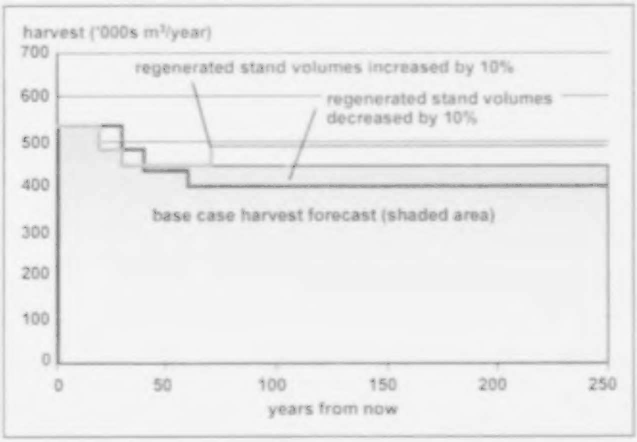

Figure 7. Changes in regenerated stand yields

*Increasing regenerated stand yields 10% increases LTHL by 10%. Yields can be increased though a variety of silvicultural actions.*

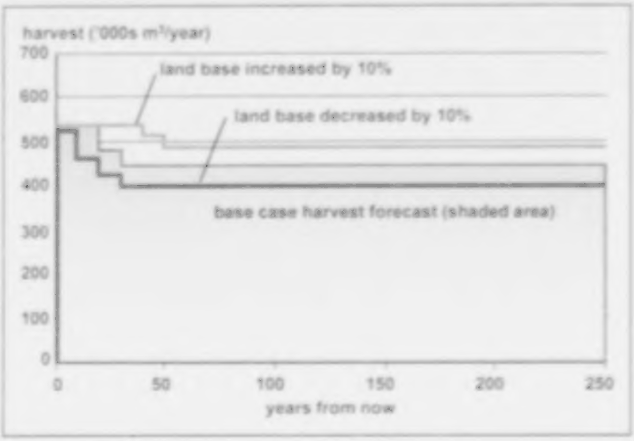

**Figure 8. Changes in timber harvesting land base**

*Increasing the THLB increases the harvest forecast in the mid and long term. Silvicultural practices can be used to rehabilitate or convert areas that have been excluded from the THLB due to poor productivity, low volumes or non-commercial cover.*

## Summary of Issues

- **Short Term (1 - 20 years)**

The TSR2 base case forecasts harvest levels can be maintained at the current AAC throughout the short term period.

Short term harvest levels are largely governed by the need to extend existing timber supply until regenerated stands become available. Thus factors that affect the existing timber supply greatly affect the ability to maintain the initial harvest level for longer or shorter than in the base case.

Decreasing the timber harvesting land base 10%, increasing minimum harvest ages by 20 years, fully applying old-seral biodiversity requirements, or allowing for some stands outside the THLB to turnover into younger stands (reducing their ability to contribute to FCC's and biodiversity) each can result in a need to lower the initial harvest level below that of the base case (the current AAC).

The short term is also sensitive to green-up age and to a decrease in the area allowed to be not greened-up. This is because recent harvesting has resulted in the area currently not greened up being close to the limits used in the base case. The area not greened-up may be under-estimated (by approx. 1 400 ha ≅ 0.5% of THLB) due to the way the model treated NSR > 20 years old.

Standard timber supply analysis modeling rules do not allow a short term increase above the initial harvest level in response to sensitivity tests. Rather, positive impacts are expressed by extending the IHL further into the mid term period. Thus no sensitivity tests show an increase to the short term harvest level.

- **Mid Term (21 - 70 years)**

In the TSR2 base case, LTHL is reached at the end of the 3rd decade. In this case, the transition period is only one decade. In the sensitivity analyses, the transition period can be extended until the 11th decade. However, it is more common for the transition period to end at or near the 7th decade, which is when the harvest moves to primarily 2nd growth. For the purposes of this strategy, the end of the mid-term period is therefore defined as 70 years.

Like the short term, the mid term is also largely governed by the need to extend existing timber supply until regenerated stands become available. Again, factors that affect the existing timber supply greatly affect the ability to maintain the initial harvest level for longer or shorter than in the base case. Unlike the short term, however, the mid term can also be affected by factors that make regenerated stands available for harvesting sooner or later than that modeled in the base case.

Decreasing minimum harvest ages extends the initial harvest level by 1 to 3 decades (depending upon the amount of decrease), but also lowers LTHL. At least some of this is modelling effect, however. Because of the lower LTHL, some timber that was previously being held to fill in timber supply in the early decades of the long term is no longer required. Under standard modeling rules, this timber supply is reassigned to extending the IHL. At least one decade of the up to 3 decade extension of the IHL in the minimum age sensitivity test can be attributed to this. This same effect is observed when regenerated stand volumes are reduced by 10%.

Increasing minimum harvest ages 10 years or decreasing existing stand volumes creates a mid term shortfall below the LTHL and extends the time until the LTHL is reached to the end of the 11th decade.

Increasing regenerated stand volumes 10% generates a mid term shortfall by raising LTHL above the base case level (but does not lower the mid term below the base case which happens in the case of increased min ages or decreased existing stand volumes).

### ◆ Long Term (71 + years)

The long term harvest level as indicated in the TSR 2 base case may be overestimated due to:

- ages of stands outside the THLB that contribute to FCC's are advanced over time but do not turn over into regenerated stands (sensitivity analysis indicates that if current ages are frozen LTHL drops 10%);
- the base case harvest queue is relative oldest first, which does not reflect the current harvest profile (see TSR2 report, 37, 109 - sensitivity analysis indicates a 9% lower LTHL if the harvest queuing is random);
- low site stand area is underestimated by an area equivalent to 4.5% of the THLB (likely a 2-3% impact); and
- armillaria root rot is not factored into regenerated stand volumes (can reduce some stand volumes by 20%).

Offsetting these to some degree, but likely not entirely, is the possibility that the site productivity of older stands may be underestimated. Sensitivity analysis indicates LTHL would rise 8% above the base case if site indices are underestimated by 2.5 m.

Because of the reliance on forests outside of the THLB to assist in meeting adjacency and older forest requirements, the long term is sensitive to changes in these. Increases in requirements can only be met by stands from within the THLB.

Because harvesting is consistently limited by forest cover constraints in the VQ zone, either relaxing or restricting these requirements directly impacts long term timber supply, more so when requirements are increased to allow less area in this zone to be disturbed at any given time.

Decreasing minimum harvest ages by 10 or 20 years significantly reduces the LTHL, presumably because stands are consistently harvested before reaching maximum growth potential.

As is the case in virtually all management units, the long term is sensitive to changes in regenerated stand volumes. A 1% increase or decrease in volume results in a corresponding approximately 1% increase or decrease to LTHL.

- **Potential for Change in the Shape of the Harvest Forecast**

Confirming the shape of the TSR2 harvest forecast is necessary because different silviculture opportunities arise in association with different shapes. There is a degree of uncertainty of the base case, resulting in the need for flexibility regarding implementation of the workshop results as ongoing reviews of issues occur. In choosing and ranking silvicultural strategies, those that will prove valid across the range of possible scenarios, should generally be given a higher priority than those tied into a specific scenario having a degree of uncertainty about it. It should also be recognized that the shape of a harvest forecast can be highly controlled by modeling rules, such that different rules could generate different shapes.

The Golden timber supply analysis explored a number of possible factors unique to the TSA that have the potential to reduce the harvest forecast. These included potential reductions due to modelling the stands outside the THLB without regeneration, the underestimation of areas of low site productivity, and differences in harvest queue rules. The sensitivity tests for these all show similar shapes to the base case.

Sensitivity tests for changes in forest cover constraints (i.e., for biodiversity requirements, allowable disturbance levels in different management zones and green-up requirements) all show the same shape as in the base case, regardless of whether constraints are relaxed or tightened.

The sensitivity tests for minimum harvest ages show potential for change in the shape of the harvest forecast. Of particular interest are the tests for increases in minimum ages. These tests show a higher long term harvest level than the base case, and create a lengthy mid term shortfall period. Decreasing ages, on the other hand, extends the initial harvest level significantly, but otherwise does not change the shape of the forecast from that of the base case.

There are two likely upward influences on the base case forecast that are quantified by sensitivity analysis. One of these, increased regenerated stand volumes, shows a rise in the long term harvest level at the start of decade 8, creating a mid term shortfall. This is significant in that, as will be seen, silvicultural strategies have the potential to substantially increase regenerated stand volumes. The other test, for an underestimate of site productivity, shows a similar shape to that of the base case. However, in this test both reduced minimum ages and increased site indices were applied. Were a productivity increase alone applied, the effect would likely have been similar to that of increasing regenerated stand volumes, that is, it likely would have raised the long term harvest level and created a mid term shortfall. Combining the two factors into one test shows the potential of reducing minimum harvest ages to fill in the mid term shortfall generated by an increase in regenerated stand volumes.

In the district workshop, factors such as operability, spatial distribution of harvest, extent of ESA1 areas and higher TIPSY OAF's were also raised as possible downward influences on the base case, but were not quantified. With the exception of higher TIPSY OAF's these factors, if proven, would likely have a downward influence on the forecast across all time periods. This would tend to move the entire forecast lower, but otherwise not change its shape from that of the base case. Higher TIPSY OAF's would reduce regenerated stand volumes, which if taken from the anticipated increase in these volumes mentioned above, would lessen but not likely eliminate the consequent rise in LTHL.

Future land base reductions could change the profile of the harvest forecast if a substantial area of younger or middle aged forests are removed. This suggests silviculture strategies appropriate to the existing land base and forest profile may not be robust against future change in the TSA land base. However, this is true of most TSA's and should not be cause for inaction; rather, when choices between strategies or actions are to be made, this factor should be kept in mind.

In conclusion, for the purposes of this interim strategy, it is assumed that:

- the shape of the harvest forecast is not likely to change in response to most uncertainties;
- an increase in regenerated stand volumes will generate a mid term shortfall; and
- a reduction in minimum harvest ages has the potential to alleviate this shortfall to some degree.

Further, in the absence of better information, the base case harvest forecast is accepted as the benchmark against which the potential outcomes of silvicultural strategies are estimated. When the TSR2 AAC rationale is released, adjustments to the base case could be made in accordance with the chief forester's findings with respect to these factors.

### ◆ Future Timber Quality

To date there has been little attention to the matter of future timber quality. The focus of the Timber Supply Review on AAC determination has resulted in the planning emphasis being solely on timber quantity. Until recently, there has been little higher-level policy guidance with respect to managing for future timber quality.

Using age as a surrogate measure of timber quality, the projected decline in harvest ages towards minimum ages indicates future timber quality will be generally be lower than today's. The future timber supply will be much smaller in average diameter and, without pruning, there will be little, if any, clear wood. On the positive side, most harvested second growth timber will be sound wood with little or no decay.

Were more old-seral biodiversity requirements to be met from within the timber harvesting land base the harvest ages of some stands would lengthen considerably, giving a commensurate increase in the average quality content of future harvests when some of these areas are harvested. However, these stands may tend to occupy poorer quality growing sites, and once set aside for the purpose of providing old-seral biodiversity, may be held for great lengths of time. Tracking these stands through modeling would help improve understanding of the implications of different management scenarios on the future harvest quality profile.

Lower quality stands present some future market risk. In low market periods it is often only the readily accessible, higher-quality timber that is profitable to harvest. Also, a narrow portfolio of small diameter timber offers less opportunity for creating a range of value-added forest products.

# Incremental Silviculture History

Approximately 1 400 ha are harvested annually (TSR2 report, 28).

| Treatment | TSR2 Status (1998) | | Current Status (1998) |
|---|---|---|---|
| | Incorporated in Timber Supply Analysis | Not Incorporated in Timber Supply Analysis | Source: CFD[3] |
| ◆Backlog | All backlog areas (1 400 ha - analysis report p 119, au's 11 to 53) are considered part of the THLB. | | 2 100 ha total, about 300 of which is treatable. |
| ◆Conversion | | | |
| ◆Commercial Thin | | | Nil |
| ◆Space | | | Current level about 40 ha/yr. Max. past program level of 400 ha/yr. |
| ◆Prune | | | No pruning program at present. Max past program level of 100 ha/yr. |
| ◆Fertilize | | | Nil |

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[3] CFD - Columbia Forest District

# *Higher Level Goals and Objectives*

This section documents higher level goals and objectives relevant to a silviculture strategy for the TSA.

## Provincial Goals

Fundamentally, government's goals can be characterized as:

- sustainable use;
- community stability; and
- a strong forest sector. (MoF, 1998a)

## Provincial Objectives

Until provincial targets for timber quantity and quality are established, management unit strategies are to consider the following interim provincial strategic objectives (MoF, 1998a). Silviculture strategies must also be in keeping with higher level plans under the Forest Practices Code.

**Objective 1:** Maintain current harvest levels as long as possible without creating disruptive shortfalls in future timber supply.

**Objective 2:** Create a long term timber supply capable of supporting a steady long term provincial harvest level similar to current levels.

**Objective 3:** Minimize the interim shortfall in provincial harvest anticipated before a steady long term timber supply is achieved.

**Objective 4:** Create a long term timber supply which will enable the timber quality profile of future harvests to be the same or better than the current profile.

It is recognized that not every management unit has the same capability to contribute to these interim objectives. Further, it is recognized that these objectives may not be attainable at current funding levels. Their purpose is to provide general guidance to the application of available funds.

## Regional Objectives

The region has not set out formal regional silviculture objectives. In the interim, the provincial objectives are accepted as being broadly applicable within the region.

## Higher Level Plans

Formal higher level plans are strategic plans defined by the Forest Practices Code, however, there are currently no approved higher level plans covering the Columbia Forest District. The Kootenay Boundary Land Use Plan has been approved but the decision whether to make it a higher level plan has not been finalized. Until that time it provides guidance for management practices.

There are other plans that exist at a higher level which are strategic (policies and guidelines), or operational that provide direction to any lower level of plans, prescriptions, or forest practices. These, however, are not higher level plans as defined under the Code.

# Opportunities to Increase Timber Supply

## Potential Silviculture Strategies

Prior to the initial demonstration workshop, information in the previous sections was used to identify the following silvicultural strategies as having potential to either maintain or increase future timber supply at the TSA level. Each of these were discussed in detail in both the demonstration and follow-up district workshops, the results of which are recorded in "Workshop Review of Potential Strategies," page 24, along with additional strategies that arose during the meetings. Strategies that are ultimately adopted are noted in "Silviculture Strategies," page 53.

### ◆ Short Term (1 - 20 yrs)

ST 1: Reduce the area not greened-up by 25% by accelerating the growth of existing young stands by: (maintain)[4]

- a) brushing for growth enhancement;
- b) spacing and fertilizing free growing (FG) stands in watershed & VQ zones where green-up is 6m.

ST 2: Fertilize all suitable stands scheduled for harvest in the 2nd decade. (increase)[5]

### ◆ Mid Term (21 - 70 yrs)

MT 1: Implement partial harvesting (CT?) regimes in all zones (particularly the VQO zone) to overcome adjacency limitations. (increase)

MT 2: Repeat fertilize all suitable existing stands scheduled for harvest 20 to 80 years from now to achieve the same harvested volumes as modeled in the base case but at lower min harvest ages. (increase)

MT 3: (a) Reduce minimum harvest ages 10 years while at the same time, (b) increase the volume of regenerated stands by 10% over those used at the base case minimum harvest age (LT impact), and (c) achieve green-up 3-5 years earlier (LT impact) by:

- i) using improved seed; (increase)
- ii) managing stocking so voids do not account for more than 10% of the area; (increase)
- iii) using larger planting stock; (increase)
- iv) fertilizing at the time of planting; (increase)
- v) brushing for growth enhancement (i.e., not only for survival); (increase)
- vi) spacing stands; (maintain) and

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[4] (maintain) means oriented to maintaining the harvest level indicated by the TSR 2 base case.

[5] (increase) means oriented to increasing harvest levels above those indicated by the TSR2 base case.

vii) repeat fertilize suitable stands on a 15 yr return cycle.

MT 4: Commercially thin stands to create old-seral attributes earlier. (maintain)

- Long Term (71+ yrs)

LT 1: (a) Rehabilitate all remaining treatable backlog NSR and (b) brush ___ ha of existing backlog plantations. (maintain)

LT 2: Increase the THLB by:

a) rehabilitating non-commercial brush (NCBr); (increase)

b) converting/rehabilitating deciduous stands; (increase)

c) converting/rehabilitating non-merchantable hemlock stands; (increase)

d) improve the site productivity of low-site stands by (fertilization?). (increase/maintain)

LT 3: Continue MT 3. (increase)

LT 4: Reduce losses to root rot by __________ (maintain).

LT 5: Plant areas outside of the THLB to increase the area in an old-seral state in 100 to 200 years. (maintain)

LT 6: Continue MT 4.

## Workshop Review of Potential Strategies

Explanatory notes with respect to the following tables.

The response time frame (i.e., the short, mid or long term) is the period in which the anticipated result is expected, not the period in which actions must necessarily commence. The harvest forecast for each period uses the TSR2 base case as the starting level. The harvest forecast column was not thoroughly reviewed during the district meeting. *Results are largely conjecture and are meant to illustrate the potential of the strategies.*

| Column Number | Note |
|---|---|
| 1 | Strategy numbers correspond with the numbers recorded earlier in "Potential Silviculture Strategies," page 23. Items followed by an asterisk (*) were added during the district workshop. |
| 2 | Information is largely from a meeting of Ministry of Forests and Ministry of Environment, Lands and Parks personnel and forest licensees held March 2 & 3, 1999 in Golden (the "district workshop") combined with information presented earlier in this document. |
| 3 | Anticipated results are typically calculated using the timber supply response indicated by TSR2 sensitivity analyses. |

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- **Short Term (1 - 20 years)**

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ ST 1 | 1. Reduce the area not greened-up by 25% by accelerating the growth of existing young stands by: (maintain) | 1. This is a defensive strategy. Sensitivity analysis indicates short term harvest levels would drop dramatically were more restrictive forest cover constraints were introduced.<br>TSR2 base case used a 2 metre inventory height, so the recent policy change on green-up hts has partially been incorporated. Post workshop follow-up indicates the base case time to green-up may be optimistic - the 2 metre green-up may not apply in all cases due to site specific reasons. There is also the issue that KBLUP uses 2 metre silviculture height and that if we want to keep using 2 metres, we have to start using silv. height for management and TSR.<br>Analysis of how much area below green-up and time until green-up is required (noted under "Summary of Information and Research Needs," page 55.). Efforts would focus on younger stands because treating stands that are within a few years of green-up would not be cost-effective.<br>Options primarily consist of (a) brushing for growth enhancement and/or (b) spacing and fertilizing in areas having 6m green-up requirements. | 1. N/A. Strategy orientation is to reduce risks posed by the possibility of a future increase in forest cover constraints or by the possibility that the base case time until green-up is optimistic. Brushing strategy overlaps with MT 3 (v). No spacing/fertilization opportunities identified. |
| ◆ ST 1 | (a) brushing for growth enhancement; | (a) Brushing for growth. See MT 3 (v). No additional brushing proposed here. | |
| ◆ ST 1 | (b) spacing and fertilizing FG stands in watershed & VQ zones where green-up is 6m. | (b) Spacing would have little effect on 2m green up as trees are usually not in serious competition during this time. VQO & watershed areas have 6m green-up requirement. Spacing/fertilizing of post FG / pre 6 m green-up stands is an option and can be funded by Forest Renewal BC (FRBC).<br>Zone — %THLB — Years to 6m green-up<br>VQO — 13 — 21 - 41<br>Watershed — 2 — 21 - 30<br>Post workshop follow-up indicates stands in these zones will not likely have the densities requiring spacing. Also, we may not want to space due to a resulting reduction in effective green-up due to a loss of crown closure (spacing will reduce crown closure, resulting in a potential increase to green-up - it is not just height which is important, but the assumed crown closure that comes with the height).<br>Need to identify opportunity area for fertilization. Depends on species, site class, location. May not be many candidate areas. **Assume no spacing or fertilization candidate areas to support this strategy.**<br>There is potential for overlap with other strategies (see MT3 vii). This strategy may be of | |

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| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| | | lesser importance due to the small potential area for its application and its defensive nature. | |
| ◆ ST 2 | 2. Fertilize all suitable stands scheduled for harvest in the 2nd decade. (increase) | 2. Inventory audit indicates volume estimates for existing stands are accurate. Any gain in existing volumes would therefore serve to increase harvest levels above the base case. There is a substantial area of suitable species and site productivity for fertilizing, but stand structure may not be suitable. Current planning and approval processes are inadequate to identify stands that will be harvested that far in the future. Assuming these factors could be overcome, a fertilization program of 450 ha/yr could be derived as follows.<br>Assume Pl and Fdi species respond to fertilization (40% of area) and 70% of site classes are suitable for treatment = (.4 X .7 =) 28% of THLB suitable. (Spruce and cedar may be treatable but there is no local experience with fertilizing these species - need for trials noted under "Summary of Information and Research Needs," page 55.)<br>Stands currently aged 60-80 years occupy approx. 25 000 ha of the THLB. Assuming these stands have the average species and site class distributions of the TSA, then .28 X 25 000 = 7 000 ha of treatable area. (Potential stands for fertilization were identified under contract a couple of years ago and this information could be used to refine these calculations.) Spreading treatment over a 15 yr period would result in an **annual program of roughly 450 ha/yr**. Benefits would accrue to last 5 yrs of short term and 1st decade of mid term. Based on a 5% vol. gain in fertilized stands, annual harvest gain would be 13 m3/ha over stands averaging 250 m3/ha at harvest. This would yield (13 X 450 ha/yr =) 5 850 m3/yr or 1% additional harvest volume over the 15 yr period.<br>**Short Term Harvest Forecast Summary**<br>Other than for late rotation fertilization, the workshop review of the above potential strategies indicated no opportunities for increasing the short term harvest level above the base TSR2 base case. The indicated late rotation fertilization benefit was postponed into the mid-term period. The following summarizes the short term findings in terms of a potential harvest forecast for the period.<br>**(000s m3/yr)**<br>535 1st dec.<br>535 2nd dec.<br>- grn-up<br>- fert<br>535 total | 2. 1% increase over last 5 years of the short term. Benefit passed on to increasing mid term harvest levels. |

- Mid Term (21 - 70 years)

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ MT 1 | 1. Implement partial harvesting and/or commercial thinning regimes in all zones (particularly the VQO zone) to overcome adjacency limitations. (increase) | 1. VQO zone is 13% of THLB. Harvesting from this zone is nearly always at its forest cover limits in the model.<br>Partial harvesting will likely increase out of necessary to access timber and was not discussed further in the workshop.<br>A study of partial cutting in 3 TSA's (Wang and Pollack, 1998) indicates that a global program of partial harvesting throughout a TSA can actually reduce harvest levels in early time periods (although in Golden this was found to be neutral), whereas a directed effort in a small portion of the TSA, particularly in VQO zones, can increase the overall harvest level (a 3% rise in Golden). This is due to a harvest scheduling effect; total stand volume from both partial harvesting and final harvest was by and large unchanged. (CT may offer up to 10% additional volume through recovery of timber that would otherwise be lost through mortality.)<br>Currently there is no commercial thinning program. Log products from thinnings are very sensitive to market prices. Because of a lack of candidate stands and markets, CT is not a short term option. Stands must be set up for CT through stocking control. If CT is to be an option in the mid term appropriate stocking must be ensured - some stands will require brushing in order to keep stocking levels up, while others will require spacing to keep stands from being overstocked.<br>There has been little spacing to date and there is not much spacing potential within the VQ zone. Some recent plantations may be candidates for future commercial thinning. **Needs to be analyzed further** (noted under "Summary of Information and Research Needs," page 55). | 1. Sensitivity test indicates a 10% increase in allowable disturbance limits in VQO zone extends the IHL to 3 decades and raises decade 4 harvests by 7%. LTHL increases 1%.<br>A 5% increase in limits in other zones lifts the 4th decade harvest level but not the 3rd. LTHL increases 3%.<br>No opportunities identified. |
| ◆ MT 2 | 2. Repeat fertilize all suitable existing stands scheduled for harvest 20 to 80 years from now to achieve the same harvested volumes as modeled in the base case but at lower min harvest ages. | 2. Effectively, this strategy is a continuation of ST 2. See ST2. | 2. Possible 1% increase in harvest level in decades 3 and 4. Regardless of effect at the management unit level. should consider fertilization for stand level effects. |

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ **MT 3** | 3. (a) Reduce minimum harvest ages 10 years while at the same time, (b) increase the volume of regenerated stands by 10% over those used at the base case minimum harvest age (LT impact), and (c) achieve green-up 3-5 years earlier (LT impact) by: | The actions listed below (items i to vii) can influence both the mid and long term harvest levels depending upon the degree to which the objectives listed to the left (a - c) are attained. To avoid duplication, they are all evaluated together in this section. | |

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<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td>◆ MT 3</td><td>i) using improved seed; (increase)</td><td>3. (i) 100% of areas are planted. Of this, about 60% is genetically improved stock. All S (which is 60% of planting) is improved. No improved Cw or Hw. Latest estimates of yield gains are (%):[6]
<table>
<tr><th>Species</th><th>Cur Species %</th><th>Future Species %</th><th>1st gen % gain</th><th>2nd gen % gain</th></tr>
<tr><td>S</td><td>40</td><td>55</td><td>22</td><td></td></tr>
<tr><td>Pl</td><td>20</td><td>20</td><td></td><td></td></tr>
<tr><td>Fdi</td><td>20</td><td>15</td><td></td><td></td></tr>
<tr><td>Cw</td><td>10</td><td>5</td><td></td><td></td></tr>
<tr><td>Hw</td><td>10</td><td>-</td><td></td><td></td></tr>
<tr><td>Other</td><td>-</td><td>5</td><td></td><td></td></tr>
<tr><td></td><td>100</td><td>100</td><td></td><td></td></tr>
</table>
Based on S alone, LTHL can be expected to rise 12% (55% of area X 22% gain). If Pl and Fd added to S, <b>an 18% rise could occur</b> (90% of area X 20% gain). Yield gains were not included in TSR 2.<br><br>Tree improvement could significantly reduce green-up & minimum harvest ages. Sw SI 17-21 is expected (based on analysis unit 132, p 125, TSR2 analysis report) to yield 193 and 249 m3/ha at ages 70 and 80 respectively. Increasing these by 20% gives yields of 230 and 300 m3/ha respectively.<br><br>There are no tree improvement plans for other species within the Golden TSA at this time. Expanding the tree improvement program to include Fdi & Pl would likely offer similar gains to that of S and should be a high priority. <b>Opportunity area = approx ½ of ann area harvested not currently planted with improved seedlings = 700 ha/yr. Priority is East Kootenay mid-elevation Pl.</b></td><td>3. (i) 12-18% LTHL gain. Lower green-up ages starting in 1-2 decades. Could lower minimum ages 10-20 yrs depending on species and site productivity.<br><br>See "Summary" below.</td></tr>
<tr><td>◆ MT 3</td><td>ii) managing stocking so voids do not account for more than 10% of the area; (increase)</td><td>(ii) TIPSY standard OAF1 factor for voids is 15%. Objective is to reduce this to 10%. Current free growing requirements will result in < 15% in voids, however the actual amount is unknown. Only approximately 19% of the total land area of the Golden TSA is within the THLB. This implies more rugged terrain, so an OAF1 of 15% may be reasonable. There is a need for completion of surveys for voids to get a measure of the actual area in voids (noted under "Summary of Information and Research Needs," page 55). Voids can be desirable for wildlife habitat, so intensive void management may not be practicable on all areas.</td><td>3. (ii) No opportunity.<br><br>See "Summary" below.</td></tr>
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[6] Source: Ivan Listar.

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ **MT 3** | iii) using larger planting stock: (increase) | (iii) Pre free-growing item.<br>Mostly plant 1+0 415d stock. Increased cost for larger stock may be (1400 ha/yr X 1200 trees/ha X $.30/tree =) $500,000/yr. Upper bound of opportunity area is the annual area planted = 1 400 ha/yr. Depending on size of stock, could reduce green-up ages and minimum ages 2-3 yrs.<br>Workshop participants did not view this as a viable option. For now, **no opportunity is assumed.** | 3. (iii) No opportunity.<br>See "Summary" below. |
| ◆ **MT 3** | iv) fertilizing at the time of planting: (increase) | (iv) Pre free-growing item. Not presently eligible for FRBC funding and not likely to be voluntarily undertaken unless necessary to achieve FG.<br>Only a little amount of fert at time of planting has been done within the TSA with the objective of overcoming brush competition. Results are inconclusive. Could be a matter of fertilizer formulation. Experience elsewhere shows fertilizing at time of planting can give similar early results as using larger planting stock. For now, **no opportunity is assumed.** | 3. (iv) No opportunity.<br>See "Summary" below. |
| ◆ **MT 3** | v) brushing for growth enhancement (i.e., not only for survival): (increase) | (v) Of the 1 400 ha logged/yr at least 600 ha (up to 1 000 ha) require brushing for survival. Approx 1/3 to ½ of these (400 ha) require a 2nd brushing for survival (equals annual basic brushing program of 1 100 - 1 500 ha), leaving 200 ha that could receive a 2nd brushing for growth. Another 200 ha of otherwise unbrushed logged area could receive a brushing for growth treatment, for a total **possible program of 400 ha/yr**. Habitat Protection Branch is more concerned about the brushing method used than the area brushed.<br>The additional brushing will reduce voids in the stand and will bring it closer to meeting target stocking standards rather than minimums. If 50 additional trees/ha survive = (50/1 200=) 4% greater survival. If this occurred on (400/1400=) 0.3 of the area = (0.3 X 4%=) 1.2% LTHL gain. Cost would be 400 ha/yr X $450/ha = $180,000/yr.<br>Typically, trees are brush for survival up to 1m in ht. Between 1 m and 2 m ht, tree growth is slowed by brush and some additional mortality occurs. However, because free growing obligations will be met, no brushing occurs after the 1 m ht is reached. Brush impedence is estimated to add 1 yr to reaching free growing and therefore 1 yr to culmination. This is equated to a 1% volume loss.<br>Brushing for growth should be reviewed more closely when silviculture modeling is done for the TSA. There is also a need to determine the correct OAF1 factors on these sites both with and without brushing for growth (noted under "Summary of Information and Research Needs," page 55). For the purpose of this exercise it is assumed the TSR | 3. (v) 1% gain from reduced brush impedence + 4% gain from increased survival = 5% gain. Applicable to 400/1400 ha = net LTHL gain of 1.4%. Conservatively rounded down to 1%.<br>See "Summary" below. |

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| | | OAF1 factor of 15% is correct and reflects brushing for survival only. (For a 15% OAF1 to be correct, a stand planted to 1 200 sph must have about 1 000 sph at free growing to match the forecast used in TSR2.) | |
| • MT 3 | vi) spacing stands; (maintain) and | (vi) Virtually no basic spacing is necessary. TSR assumptions for establishing min. harvest ages for regenerated stands include a min 25 cm DBH criterion. TSR use of TIPSY yields based on establishment at 1200 st/ha assumes stocking control - either brushing to prevent under-stocking or spacing to keep from over-stocking. Not all stands will require spacing, but failure to maintain the assumed stocking levels may postpone time until stands reach 25 cm and therefore lengthen minimum harvest ages. (Usually a lower OAF1 should be used for spaced stands than for brushed stands.)<br>During the workshop, it was discovered that the sensitivity to minimum ages is likely attributable to a shortage of stands currently aged 40 to 50 years old (see Figure 1, page 13). Accelerating the growth of stands currently aged 20-30 years old to make them harvestable (i.e., min 25 cm avg dbh and 175 m3/ha) at earlier ages, without unduly lessening site occupancy, would achieve a similar effect on the harvest forecast as demonstrated by a reduction in minimum harvest ages.<br>There are about 35 000 ha of stands aged 20 - 30 years. Most of these are in the Sue Fire / Beaverfoot valley areas. They are estimated to consist of 50% Pl, 25% Fdi and 25% S. Because the stands are contiguous, forest cover constraints may affect their availability at harvest, so full effect on the harvest forecast may not be achieved. 80% of this area already has reasonable spacing so 0.2 X 35 000 ha = 7 000 ha spaceable. (Important to check out on the other 28 000 ha what stocking levels will postpone the time to achieve the minimum piece size criteria, and the occurrence of these stands - noted under "Summary of Information and Research Needs," page 55.) Reducing this by half (to allow for operational reasons such as slope which may prevent treatment, as well as allowing for some of these areas to be managed for longer rotations to allow for quality) and spreading over a 10 year period = **350 ha/yr spacing program**. These stands are targeted for early harvest at lower minimum ages and therefore should not be included as target stands for quality types III and IV.<br>**No additional stands identified for spacing beyond those for wood flow (see above) and quality (see Q1 below)**. Spacing could reduce minimum harvest ages 10 years. Further analysis required. | 3. (vi) Reduce min harvest ages on 3 500 ha to allow earlier harvest in decades 6-8. 1 decade total harvest = 14 000 ha. 3 500 ha = (3500/14000) 25% of a decade harvest. If spacing reduces ages 10 years, then a 10 yr reduction on 25% of the area is the equivalent of a 2.5 yr reduction on the whole area. TSR sensitivity test indicates a 10 yr reduction in min ages extends IHL 3 decades over the base case. A 2.5 yr age reduction therefore roughly equates to a 1 decade extension of IHL.<br>See "Summary" below. |
| • MT 3 | vii) repeat fertilize suitable stands on a 15 yr return cycle. | (vii) On a steady state basis, 40% of the species on 70% of the site classes, or 28% (46 600 ha) of the total THLB (166 600 ha) could be suitable for repeat fertilization. If 80% of these have suitable stand conditions, this area is reduced to (46 600 X .8 = 37 300 ha). However, not all areas would be available to be fertilized. Assuming 80% of areas are available (.8 X 37 300 = 30 000 ha), on a 15 yr return cycle, a maximum | 3. (vii) A 10% volume gain would increase harvest levels (30000/166 600 X .1 =) 2%. 5-10 year |

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| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| | | fertilization **program would then be (30 000/15=) 2 000 ha/yr**.<br>**Stands spaced for the purpose of reducing minimum ages should be priority for fertilization. This could lower their min ages a further 5-10 years.** | lower min ages on fertilized stands.<br>See "Summary" below. |
| ◆ **MT 3** | 3. (a)-(c) Summary | 3. (a)-(c) Summary | 3. (a)-(c) Summary<br>(a) Sensitivity analysis indicates a 10 yr reduction in min harvest ages will extend the initial harvest level to decade 5. This reduction in ages is only needed in this time period due to an age class imbalance.<br>(b) Sensitivity analysis indicates a 10% increase in regen vol's results in a 10% increase in long term harvest levels. A 19% increase in regen vol's therefore yields a ⇒ 19% increase in LTHL. This rise might be delayed 2-3 decades due to lower minimum ages in decades 7-8.<br>(c) N/A<br>Increased site productivity may further compound these effects. |

| Treatment | % Increase in Vol (net) | (LT potential) | Lower Min Ages (yrs) (oppt'y factor) | (net oppt'y) LT | Decade7 |
|---|---|---|---|---|---|
| improved seed | 12-18 | 10-20 | 90% of area | 14 | - |
| red. in voids | - | - | (no oppt'y) | - | - |
| larger stock | - | 2-3 | (no oppt'y) | - | - |
| fert. at planting | - | 1-2 | (no oppt'y) | - | - |
| brush for growth | 1 | 1-2 | (on 4/14" of area) | 1 | - |
| spacing | - | 10 | (3 500 - 7 000 ha: decades 3-5) | - | 2.5-5 |
| repeat fert. | 2 | 10 | (18% of THLB) | 2 | - |
| TOTAL | 15-21 | ?* | | 17* | 2.5-5 |

*Some effects may not be additive, but others may compound. Can usually take the benefit either in the form of increased volume or reduced harvest age, but not both.

(a) A 10 year reduction in min harvest ages is readily achievable over the long term. However, fewer options are available in decade 6 or 7. Depending on the ultimate allocation of spacing efforts between volume and quality objectives, minimum ages in this period could be lowered between 2.5-5 years when the spaced area is prorated across the 14 000 ha to be harvested in a decade.

(b) A 15-21% gain in regenerated stand volumes appears achievable, depending largely on the extent of the tree improvement program. If benefits are taken in the form of earlier harvest ages, the volume gains would be proportionately less.

(c) Although a 5 yr earlier green-up is likely possible given the potential for improved silvicultural practices and the recent change in standards for measuring green-up, there is some reason to believe the base case green-up ages are optimistic - see ST1. Assume no change.

Aggressive site preparation and reforestation is necessary to meet the objectives. These will improve initial seedling survival and growth. Planting and/or brushing alone is not

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| | | sufficient to produce the desired volumes. | |
| ◆ MT 4 | 4. Commercially thin stands to: | 4. Old seral stage is critical. Due to modeling methodology, the contribution of areas outside the THLB to meeting requirements was possibly overstated. Sensitivity analysis indicates the base case may be overstated in the long term by 10%. On the other hand, current fire suppression fire suppression activities outside the THLB are capable of maintaining most areas as older forests.<br>The caribou and ungulate winter range zones are particularly constraining. Silvicultural activities, particularly commercial thinning, can be used to create old-growth tree attributes at earlier ages, thereby relieving some constraints. However, some other biological requirements may not be met. Analysis is required to determine if CT can achieve these attributes earlier. FSSIM analysis also required to determine possible timber supply effect of lowering ages for caribou habitat from 250 to 200. (Noted under "Summary of Information and Research Needs," page 55). | 4. Subset of MT1. |
| ◆ MT 4 | (a) create old seral attributes generally across all zones; | (a) Not discussed in the workshop. | (a) N/A |
| ◆ MT 4 | (b) create old-seral attributes earlier in caribou winter range (maintain);*[7] and | (b) The caribou winter range zone occupies 11.9% of the ICH and 2.6% of the engelmann spruce-subalpine fir (ESSF) zones (14.5% of THLB). About 40% of this area (6% of THLB) has specific caribou prescriptions.<br>The current requirement is 40% of these areas must be in stands ≥140 years old and 10% ≥ 250 years. As a first step, further research is required to determine lichen production rates under different stand conditions and ages. Once this is known silvicultural strategies can be devised to achieve these conditions at an earlier age, if further analysis indicates the required ages for caribou habitat are still limiting timber supply. In the absence of better information, it is expected that the objective of a management strategy would be to create more open stand conditions to encourage lichen growth on trees. Commercially thinning 60 -70 year-old stands accelerates the development of the desired stand structure and lichen growth. This may enable reducing the age limitations to 100 and 200 years respectively.<br>Meeting the objective may require spacing stands now to set them up for commercial thinning in 30 - 50 years from now. The current age class structure indicates candidate stands may be available. **Modeling/further analysis is needed to determine extent of candidates & potential impact.** | (b) Further modeling required. |

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[7] * - indicates added during the district working session.

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ♦ MT 4 | (c) create old-seral attributes earlier in ungulate winter range. (maintain)* | (c) For deer winter range, the stand structural objective is deep, wide crowns for snow interception. A fertilization treatment after CT would help promote crown development. | (c) Not discussed. |
| ♦ MT 4 | (a) - (c) Summary | 4. Summary: Both (a) and (b) would likely be a subset of the strategy to CT for harvest flow purposes. See MT 1. Further modeling required. **No specific strategies proposed.**<br>**Mid Term Harvest Forecast Summary**<br>Multiple alternatives are possible depending upon the allocation of the spacing benefit between reducing minimum harvest ages (resulting in a volume effect) or improving stand quality. The preferred district alternative is to split the benefit between the two. On this basis, the allowable cut effect could be either used to maintain the IHL for an additional decade, or to spread the equivalent volume across the entire mid term, raising the bottom of the mid term trough. See Figure 10, page 40 for these and other alternative.<br>(Base case not adjusted for possible over-estimates acknowledged in TSR2 analysis report. When released, adjustments should in accordance with CF TSR2 AAC determination.) | (a)-(c) Modeling required. |

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- **Long Term (71+ years)**

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td>◆ LT 1</td><td>1. (a)Rehabilitate 300 ha of remaining treatable backlog NSR (maintain); and<br>(b) Maintain approx. 400 ha of previously reforested backlog plantations. (maintain)</td><td>1. (a) About 2 100 ha of backlog remains, about 300 ha of which is treatable. <b>A program of 300 ha/yr of fill planting over the next 1 year is needed</b>. Cost is $200/ha. Each ha will require 2-3 brushings. See schedule below.<br>(b) About 400 ha of previously reforested area requires maintenance to ensure free growing is achieved. Brushing is needed on some plantations to ensure they attain free-growing. <b>An initial program of 300 ha/yr, declining to 100 ha/yr over the next 5 years is needed to maintain this area as well as newly reforested area under (a) above</b>.<br>The following program is required.
<table>
<tr><th></th><th colspan="5">Area (ha)</th></tr>
<tr><th></th><th></th><th></th><th colspan="2">Brush</th><th></th></tr>
<tr><th>Year</th><th>Site Prep</th><th>Plant</th><th>New Plantation</th><th>Existing Plantation</th><th>Total</th></tr>
<tr><td>1</td><td>-</td><td>300</td><td>200</td><td>100</td><td>300</td></tr>
<tr><td>2</td><td></td><td>-</td><td>100</td><td>200</td><td>300</td></tr>
<tr><td>3</td><td></td><td></td><td>100</td><td>100</td><td>200</td></tr>
<tr><td>4</td><td></td><td></td><td>100</td><td>100</td><td>200</td></tr>
<tr><td>5</td><td></td><td></td><td>-</td><td>100</td><td>100</td></tr>
<tr><td>6-10</td><td></td><td></td><td>-</td><td></td><td>-</td></tr>
</table></td><td>1. (a) (b) Maintain base case LTHL. Failure to treat would result in a drop in LTHL.</td></tr>
<tr><td>◆ LT 2</td><td>2. Increase the THLB by:</td><td>2.
<table>
<tr><th></th><th>Area (ha)</th><th>%tot area</th><th>%prod area</th><th>%THLB</th></tr>
<tr><td>(a) NCBr</td><td>2 100</td><td>.2</td><td>.7</td><td>1.3</td></tr>
<tr><td>(b) Decid</td><td>10 600</td><td>.9</td><td>3.6</td><td>6.3</td></tr>
<tr><td>(c) Non-merch</td><td>1 300</td><td>.1</td><td>.4</td><td>0.8</td></tr>
<tr><td>(d) Low site</td><td>9 700</td><td>.8</td><td>3.4</td><td>5.8</td></tr>
</table></td><td></td></tr>
<tr><td>• LT 2</td><td>(a) rehabilitating NCBr; (in-</td><td>(a) NCBr areas may are likely associated with avalanche tracks and do not offer potential</td><td>(a) No opportunity.</td></tr>
</table>

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| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| | crease) | for rehab. | |
| • LT 2 | (b)converting /rehabilitating deciduous stands; (increase) | (b) Decid. Most decid is aspen. Of the 10 600 ha total, about 1 600 is in ESA or other constrained areas and 2 000 ha is probably merchantable. Of the 7 000 remaining ha, about ½ is suited to ultimate conifer management with the other ½ suited to hardwood management.<br>Aspen is very important for wildlife because there is not much of it in the TSA. Consensus is to basically leave the deciduous alone.<br>Also see H8. | (b) No opportunity. |
| • LT 2 | (c)converting/rehabilitating non-merchantable hemlock stands; (increase) | (c) Non-merch is mostly Hw. By definition, this is operable and productive but of low quality. Options for management include:<br>• wait for good markets to harvest;<br>• subsidize salvage/rehab;<br>• inventory reclassification;<br>• lump in a cutting permit having mostly good wood;<br>• leave to satisfy old-seral requirements.<br>Workshop consensus that further analysis of these opportunities was required before a course of action could be selected. Noted under "Summary of Information and Research Needs," page 55. | (c) Further analysis required. |
| • LT 2 | (d) improve the site productivity of low-site stands by (fertilization?). (increase/maintain) | (d) Chief forester is unsure of the potential for improving the productivity of low site lands in this TSA.<br>May be useful to re-assess the status of these lands through an expert inventory similar to the Merritt small wood study. Noted under "Summary of Information and Research Needs," page 55. Gain to LRSY would be lower than for average site productivity. | (c) Expert inventory required. |
| ♦ LT 3 | 3. Continue MT 3. (increase) | 3. See MT 3 above. Assume:<br>(a) A 10 yr reduction in min harvest ages could be achieved. This reduction in ages may be relevant in the first few decades of the long term, following through on reduced ages in decades 6-7. After this, however, there is likely to be a gradual transition in harvest ages back towards culmination age in order to improve stand quality and volume.<br>(b) a 21% gain on regen stand volumes, based primarily on an expanded tree improvement program; and<br>(c) no change in green-up ages. | 3. (a) Sensitivity analysis indicates a 10 yr reduction in min ages will reduce LTHL by 7%. Assume min. harv. ages will not be reduced once age class imbalance passes and therefore this reduction will not occur.<br>(b) Sensitivity analysis |

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| | | | indicates a 10% increase in regen stand vol's will result in a 10% increase in long term harvest levels. A 21% gain in vol's therefore = a 21% LTHL increase.<br>(c) Sensitivity analysis indicates a 5yr reduction in green-up ages will result in a 2% increase in LTHL. However, no change in ages assumed. |
| ◆ LT 4 | 4. Reduce losses to root rot by: (maintain) | 4. A possible 2% reduction in LTHL can be estimated as follows. Significant root rot occurs primarily in Fd (20% of THLB) in ICH zone (60% of THLB). This nets to (.2 X .6 =) 12% of THLB. If these stands suffer a 15% volume loss, TSA level loss amounts to (.12 X .15 =) 2%. This may be accounted for within the global TIPSY OAF2 of 5% which is applied to all stands. Nevertheless, a goal could be to reduce root rot losses by half, to a 1% loss.<br>The need for further study of root rot management noted under "Summary of Information and Research Needs," page 55. | 4. Uncertain as to effect on base case. Assume neutral. |
| LT 4 | (a) planting alternate species;*[8] | (a) This is current practice, see MT 3 (i) for projected species changes. | (a) Current practice. |
| LT 4 | (b) pop-up spacing;* | (b) This is expensive and only suitable for heavily infected areas. **A program of 20 ha/yr is required**. | (b) Minimal effect on LTHL. |
| LT 4 | (c) pushover logging / stumping;* and | (c) This is done on a limited area where practical as part of a basic silviculture obligation. | (c) Current practice. |
| LT 4 | (d) mixed species planting.* | (d) Mixed species planting. This is current practice in most areas.<br>Note: A further technique of judicious planning use of partial cutting techniques was suggested by the region after the demonstration workshop. | (d) Current practice. |

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[8] *- indicates added during the demonstration workshop.

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| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ **LT 5** | 5. Plant areas outside of the THLB to increase the area in an old-seral state in 100 to 200 years. (maintain) | This opportunity was not discussed during the district workshop. Not likely to be practiced in the foreseeable future. More information required. | 5. N/A. |
| ◆ **LT 6** | 6. Continue MT 4. | See MT 4.<br>**Long Term Harvest Forecast Summary**<br>**(000s m3/yr)**<br>446 base case<br>- backlog<br>- incr. THLB<br>0 min ages<br>94 rgn vols (21%)<br>0 grn-up<br>- root rot<br>- plant outside the THLB<br>- prt harv.<br>540 total | 6. See MT4. Requires additional research and modeling. |

## Potential Harvest Forecast

Figure 9 graphs the potential harvest level that may be attained through implementation of the silvicultural strategies in the preceding tables. It is based on the "Harvest Forecast" summaries of the short mid and long term tables in "Workshop Review of Potential Strategies." This forecast is highly speculative and requires confirmation through computer-based modeling and analysis. It also includes silvicultural activities that are not within the traditional scope of incremental silviculture. Modeling may indicate more precise timing, targeting and program levels associated with silviculture activities than could be developed in this interim strategy. See the expanded view in Figure 10 regarding mid-term alternatives.

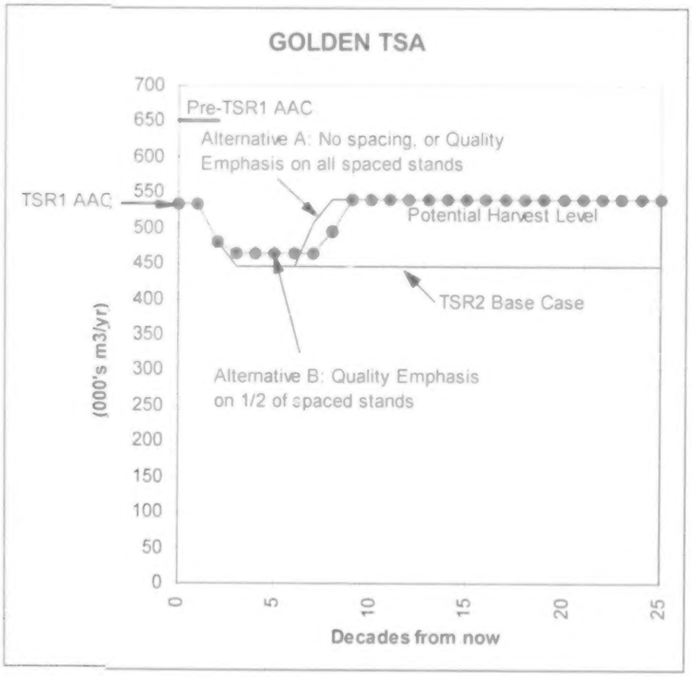

**Figure 9. Potential harvest forecast, Golden TSA**

**NB:** The TSR2 analysis report acknowledges several areas where the base case forecast may be overestimated (see "Long Term," under "Summary of Issues," page 17). In the strategy workshop, other uncertainties regarding the base case were also mentioned. At the time this strategy was prepared, the chief forester had not yet made the TSR2 AAC determination, so it was not known how he will view these. Consequently, Figure 9 contains no adjustments to the base case. In any event, the difference between the two forecasts illustrates the potential outcome of the strategy. This difference would likely remain the same in the event the base case is amended. Were the base case to substantially change shape, however, the strategies should be re-evaluated to confirm their validity.

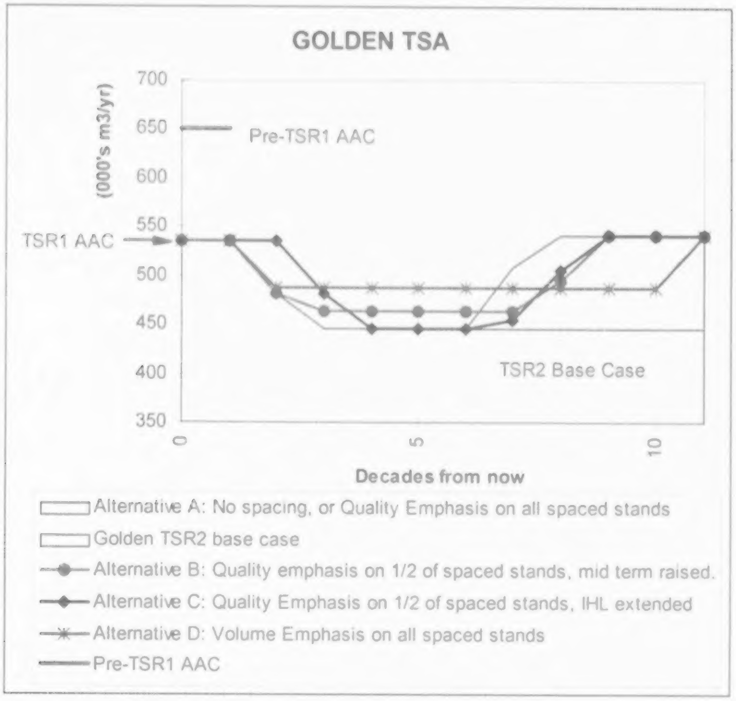

**Figure 10. Expanded view of potential harvest forecast alternatives, Golden TSA**

The TSR2 analysis report indicates the TSA is highly sensitive to a 10 year reduction in minimum ages. This was found in the workshop to likely be due to a shortage of stands currently aged 40-50 years. The minimum harvest ages of stands currently aged 10-30 years (of which there is a relatively large area) can potentially be reduced through spacing. Bringing forward the harvest of the spaced stands 10 years in time generates an allowable cut effect[9] because some older existing stands no longer have to be reserved for harvest in the latter part of the mid term time period.

Spacing can also be used to improve stand quality by increasing average stand diameter and merchantable volume at specified ages. Many such 'quality' stands would likely also be candidates for pruning. When spacing is done for this purpose, minimum harvest ages are not reduced. If ages were reduced, the stands would be harvested before reaching their target sizes.

Alternative A shows the effect of either not spacing any stands, or of allocating all spacing to quality purposes (in which case minimum ages are not reduced). The increased long term harvest level over the base case is due to increased regenerated stand volumes resulting from the strategies identified as having potential.

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[9] The term allowable cut effect (ACE) is used in forestry literature to describe situations where undertaking an action which affects stands scheduled for harvest later in the planning horizon allows higher harvest levels earlier in the horizon. This term should not be confused with the allowable annual cut determination by the chief forester. For the indicated ACE to be considered in an AAC determination, the chief forester would consider whether the spacing has taken place, whether the effects on minimum ages and harvest levels are as described, and when to incorporate them in an AAC determination. Given that none of the indicated alternatives changes the harvest forecast for the next 20 years, the ACE from spacing stands is not likely an issue in AAC determination for over this time. However, if the identified stands are not spaced soon, the window of opportunity will be lost and 20 years from now the matter of an allowable cut effect will be a non-issue.

There are about 7 000 ha of potentially spaceable stands (however, many stands have clumpy distribution and this spacing potential may not fully exist). The district plans to allocate ½ of the potential spacing (3 500 ha) to improving stand quality, in which case the minimum ages of these stands would not be planned to be reduced. Alternatives B and C illustrate harvest forecasts based on allocating ½ of the spaced stands (3 500 ha) to improving stand quality and the other ½ (3 500 ha) to reducing minimum ages. Alternative B allocates the allowable cut effect resulting from the reduced ages on ½ the stands across the mid term trough. Alternative C allocates the effect to extending the initial harvest level by one decade.

Alternative D shows how the forecast might appear if all of the spaced stands (i.e., all 7 000 ha) were allocated to increasing harvest levels through reduced minimum ages.

Relative to Alternative A, the onset of the rise to LTHL is delayed in all other alternatives. This is because the reduction in minimum ages has moved some harvest forward in time, creating something of a domino effect. The total volume harvested over time more or less does not change, only the timing of the harvest changes.

The working targets expressed in this strategy are based upon Alternative B. Follow-up analysis and modeling is required to confirm the potential benefits. They are likely over-stated in this analysis.

# *Opportunities to Improve Timber Quality*

The effects of silviculture on the future quality of the timber resource is not analyzed in the timber supply review. Information in this section was gathered during the district workshop.

## Product Objectives

The following are (unapproved) product objectives at the log level for the Golden TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log**: | | |
| Type III | All | 15% of stands having 32.5+ cm minimum average stand diameter at breast height (DBH), having 60-100% of stems with a 1st log clear of knots, and achieved through faster growth at lower stocking levels (600 sph at rotation). |
| Type IV | All | 15% of stands having 32.5+ cm minimum average stand diameter at breast height (DBH), having narrow ring width achieved through higher stand density (800 sph at rotation) and having 60-100% of stems with a 1st log clear of knots. |
| **Sawlog**: | All | 27.5+ cm minimum average stand DBH. |

## Workshop Review of Potential Strategies

The following strategies have potential to increase timber quality. These were identified in the district workshop, except the large log calculation was performed later. The response time frame is the period in which the anticipated result is expected, not the period in which actions must necessarily commence.

<table>
<tr><th>Response Time Frame</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th><th>Premium Log Forecast</th></tr>
<tr><td>◆ Short Term (1 - 20 yrs)</td><td>None</td><td>Short term harvests will come from existing older stands which are not treatable to improve quality.</td><td>Quality profile of existing old growth will prevail. Assume this is equal to a recent coast-wide estimate of 15%.</td><td>15%?</td></tr>
<tr><td>◆ Mid Term (21 - 70 yrs)</td><td>As above.</td><td>As above.</td><td>As above.</td><td>Steady decline to long term level.</td></tr>
<tr><td>◆ Long Term (71 + yrs)</td><td>Q1. ~~First lift prune 150 ha/yr to 3.1 m.~~<br>Revised in workshop to: Two-lift prune 150 ha/yr to 5.5 m. (total program of 300 ha/yr required)*</td><td>1. Maximum past pruning program has been 100 ha/yr. On a 2-lift basis this would equal 50 ha/yr under pruning management.<br>A number of program options were analyzed. Assume $1^{st}$ 5 m log = 25% of tree vol., annual harvest area = 1 400 ha/yr.
<table>
<tr><th>Ann prog - ha</th><th>two lift equiv - ha</th><th>% of ann hrvst area</th><th>% tree vol pruned</th><th>% tot hrvst vol pruned</th></tr>
<tr><td>100</td><td>50</td><td>3.6</td><td>25</td><td>1</td></tr>
<tr><td>200</td><td>100</td><td>7.1</td><td>25</td><td>2</td></tr>
<tr><td>300</td><td>150</td><td>10.7</td><td>25</td><td>3</td></tr>
<tr><td>600</td><td>300</td><td>21.4</td><td>25</td><td>6</td></tr>
</table>
District objectives are to have 60-100 % of stems with $1^{st}$ log with clear wood on 30% of area. If an average of 80% of stems were used, this equates on an area basis to .8 X 30% = 21%. From the above table, without any natural pruning, an annual pruning program of 600 ha would be necessary to achieve this objective. Because this is far above past maximum program levels, **a program level of 300 ha/yr** was adopted (during discussion of the regime table). This also recognizes the tradeoffs with having to space areas to harvest at younger minimum ages for wood flow purposes (see potential strategy MT 3).</td><td>1. A pruning program of 600 ha/yr would achieve the product objective for clear logs. However, in view of past program levels, ½ of this seems more realistic and attainable.</td><td>3% of total annual harvest volume to be in clear logs.</td></tr>
</table>

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Premium Log Forecast |
|---|---|---|---|---|
| | Q2. Space 700 ha/yr to obtain large dimension timber and prepare stands for fertilization, pruning and/or commercial thinning. | 2. See large log analysis below. | 2. See large log analysis below. | 2. See large log analysis below. |

## Large Premium Log Analysis

The following analysis is primarily for demonstration purposes. It has several weaknesses, such as: in the long term, a steady-state program of 700 ha/yr of spacing is high; stocking levels used for unspaced stands are high; and there are only about 7 000 ha of candidate stands for spacing that would be harvested in late mid-term period. Consequently the results should be used with caution until replaced with analysis-based results.

The large log analysis below indicates that, based on the assumptions used, on a long term steady-state basis, a 700 ha/yr spacing program (i.e., approx. one-half of the annual area harvested being spaced) would result in approx. 9% of future harvested volumes being large premium logs, assuming all stands are harvested at culmination of MAI (scenario 1). (Note: culmination ages are generally higher than the minimum ages used in the TSR2 analysis but are in the range of the forecast average harvest age of the base case). Scenario 1 also indicates that without any spacing there would still be a 6% large log yield (the spaced stands, if left unspaced, would still yield the same large log component as the unspaced stands shown in the analysis).

Increasing regenerated stand volumes 20% and changing the species profile to the anticipated future profile results in a lower large log component of 8%, due to both lower culmination ages and the increased proportion of spruce stands (Scenario 2). At this point, however, only Sw is from improved seed, so effects are overestimated. Analysis of spacing effects may show more positive results using other models.

Towards the end of the mid term period, that is, from decades 6-10 depending upon the chosen alternative (see Figure 10, page 40), there is a need to allocate some of the spacing benefit to lowering minimum harvest ages. Alternative B is the preferred district alternative where, out of a 700 ha/yr total program, approximately ½, or 350 ha/yr would be dedicated to lowering minimum ages and the other ½ dedicated to creating large premium logs. Assuming stands harvested at lower minimum ages have a minimal large log component, spacing 350 ha/yr for stand quality would likely result in somewhat less than one-half of the additional 3% increase shown in scenario 1 as attributable to spacing; i.e., a total of less than 7.5% large logs by volume during this period. It is assumed to be less than half because the overall average age of harvest during this time would likely drop below the culmination ages on which the scenario 1 calculations are based.

Assumptions

Avg. annual area harvested = 1 400 ha Utilization std = 12.5 cm dbh for all species

TIPSY ver 2.1d OAF1 = 15% OAF2 = 5% Ages in 10 yr steps All areas planted to 1200 sph.

all species to 32.5 cm large log. Because TIPSY table dbh classes are mid points, this translates in TIPSY yield tables to the bottom end of the 35 cm class.

Diameters and yields are at culmination age. Culmination ages are generally higher than the minimum ages used in the TSR2 analysis, but are in the range of the average harvest age of the TSR2 base case (107 yrs from decades 6-25).

% ≥ 35 cm is from TIPSY stock table, rounded to nearest 5%.

Bottom 5m log = 20% of tree vol.

% large of total ann. harv. volume = (Area/1400) X (%≥35 cm) X (20% of tree vol.)

Assume ½ of areas are spaced (700 ha/yr total).

## SCENARIO 1

SI from SIBEC/ISIS project.

TSR2 existing species profile.

| Species | %inv | SI | Space frm/to: | Area | Cul Age | Yield | % tot vol ≥ 35cm DBH class, -this tmt | % of tot harv vol (all areas) in 5m prem. logs |
|---|---|---|---|---|---|---|---|---|
| Sw | 40 | 15 | 3000/900 | 280 | 120[1] | 386[2] | 55 | 2.2 |
| | | | 3000/unspaced | 280 | 110 | 369 | 20 | 0.8 |
| Pl | 20 | 22 | 4000/900 | 140 | 70[1] | 344[3] | 40 | 0.8 |
| | | | 4000/unspaced | 140 | 60 | 306 | 5 | 0.1 |
| Fdi | 20 | 23 | 3000/900 | 140 | 100 | 475 | 75 | 1.5 |
| | | | 3000/unspaced | 140 | 100 | 477 | 60 | 1.2 |
| Cw | 10 | 18 | 3000/900 | 70 | 130[1] | 622[4] | 80[5] | 0.8 |
| | | | 3000/unspaced | 70 | 120 | 601 | 60 | 0.5 |
| Hwi | 10 | 18 | 4000/900 | 70 | 110[1] | 477[6] | 70 | 0.7 |
| | | | 4000/unspaced | 70 | 100 | 469 | 35 | 0.4 |
| Total | | | | 1400 | | | | 9.0 |

9% premium log content,6.0% from spaced stands and 3.0% from unspaced stands. Some of this will be clear.

[1] spacing raises culmination age

[2] 350 at age 110

[3] 291 at age 60

[4] 574 at age 120

[5] % likely higher - some 2nd logs will be ≥ 35cm

[6] 431 at age 100

## SCENARIO 2

Expected future species profile.

20% yield gain modeled by choosing SI yielding nearest to a 20% MAI gain over SIBEC/ISIS project SI's for spaced stands.

| Species | %inv | SI | Space frm/to: | Area | Cul Age | Yield | % tot vol ≥ 35cm DBH class, -this tmt | % of tot harv vol (all areas) in 5m prem. logs |
|---|---|---|---|---|---|---|---|---|
| Sw | 60 | 17 | 3000/900 | 420 | 100 | 376 | 50 | 3.0 |
| | | | 3000/unspaced | 420 | 100 | 390 | 20 | 1.2 |
| Pl | 20 | 24 | 4000/900 | 140 | 60[1] | 347[2] | 40 | 0.8 |
| | | | 4000/unspaced | 140 | 50 | 294 | 2 | 0.0 |
| Fdi | 10 | 25 | 3000/900 | 70 | 100 | 559 | 80 | 0.8 |
| | | | 3000/unspaced | 70 | 100 | 555 | 70 | 0.7 |
| Cw | 5 | 20 | 3000/900 | 35 | 110 | 654 | 80 | 0.4 |
| | | | 3000/unspaced | 35 | 110 | 678 | 65 | 0.4 |
| Hwi | 5 | 20 | 4000/900 | 35 | 110[1] | 570[3] | 80 | 0.4 |
| | | | 4000/unspaced | 35 | 90 | 497 | 40 | 0.2 |
| Total | | | | 1400 | | | | 7.9 |

7.9% premium log content, 5.4% from spaced stands and 2.5% from unspaced stands. Some of this will be clear.

[1] spacing raises culmination age.

[2] 277 at age 50

[3] 500 at age 100

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## Potential Timber Quality Forecast

The foregoing analysis indicates the premium log content of harvests in the mid and long term will be lower than today's levels (9% forecast vs. assumed current estimate of 15%). This forecast is based on harvesting future stands at culmination ages, which are higher then the minimum ages used in the timber supply analysis, but close to the modeled average harvested age in the analysis.

Postponing harvest to ages that are past culmination age would increase the large dimension component of premium logs. Depending upon future timber market demands and values, rotations may be extended past culmination age to increase the large dimension component of premium logs.

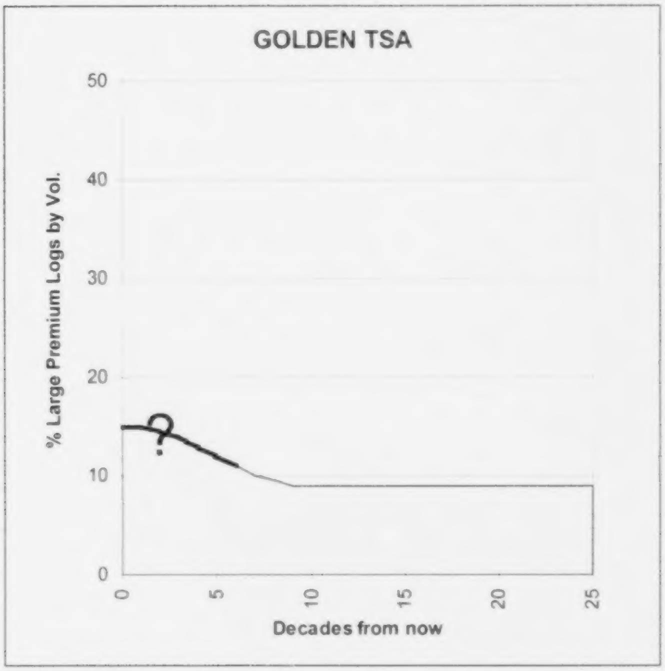

**Figure 11. Potential quality forecast, Golden TSA**

This potential quality forecast is based on large-premium logs. The current timber quality profile is unknown. Rough analysis indicates large logs could form 9% of future harvests (based on spacing 700 ha/yr) and clear logs 3% (based on pruning 300 ha/yr which is the equivalent of 150ha/yr under 2-lift management). Most of the clear logs will also be large logs. Further analysis is required to improve upon these forecasts.

# *Opportunities to Improve Habitat Supply*

## Workshop Review of Potential Strategies

The following strategies have potential to increase habitat supply or improve habitat quality. These were identified in the district workshop. No response time frames were identified. [This can be improved over time - What are the supply objectives in terms of ha's of thermal cover, ha's of winter range, when might there be shortages of these and how can silv be used specifically to help fill the gap.]

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Habitat Supply Forecast |
|---|---|---|---|---|
| | H1. Increase thermal cover in winter ranges by<br>(a) preferred species selection; and<br>(b) diversifying habitat through harvest scheduling. | [Goal for ha to be continuously maintained in thermal cover? Spatial requirements?]<br>(a) Obtaining crown closure as soon as possible after harvesting restores thermal cover. Desired species are Fdi, Sw and Cw. Pl is not favoured due to its narrower, sparser crown. The preferred species should be selected during both planting and spacing treatments.<br>(b) Harvest scheduling can be used to increase the diversity of habitat types. In large contiguous areas of similar timber types, planning harvests to cut some areas sooner and holding others longer will accomplish this. | | ? |
| | H2. Increase forage for ungulates by<br>(a) commercial thinning, with Fdi as the preferred leave species; and<br>(b) spacing/fertilizing Fdi stands. | [Goal for ha to be continuously maintained in forage production? Spatial requirements?]<br>(a) Stands in ungulate winter ranges with a high component of Fdi are preferred, this being one of the better species for snow interception. Commercial thinning, bringing crown closure down to 70/75 percent, will open up the stands to allow more light to reach the forest floor to increase forage supply while maintaining snow interception. This will promote forage production. [Goal - ha's of CT] [When?]<br>(b) Program? | | ? |

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Habitat Supply Forecast |
|---|---|---|---|---|
|  | H3. Manage riparian zones for a natural diversity of species by planting a natural vegetation mix on all areas within the zone. | 3. Manage the actual riparian area for a natural diversity of species. Do not force a conifer monoculture. The actual riparian area does not fully equate to the code's Riparian Management areas. |  |  |
|  | H4. Manage NDT 4 for ______ through regimes of spacing, CT and partial harvesting. | 4. Natural disturbance type 4 includes ecosystems with frequent stand-maintaining fires. In the Golden TSA this occurs on the drier IDF biogeoclimatic zone. Fire suppression has altered fire regimes, resulting in species changes and denser stocking.<br>The objective of this strategy is to maintain newly established stands in -or return older existing stands to- a more open stand condition. Harvest planning should consider partial cutting in this zone. Silvicultural techniques of spacing and commercial thinning can be used in younger stands.<br>[How many ha's of NDT4 are there? What is it's current status? Is there a quality scale? How might this affect harvest levels? Is there a win-win here; eg. pruning to improve the stem value? Could mechanical pruning work on wider spaced stands to lower the costs. How many ha's of spacing and CT are needed here? What about burning? What time frames - short, mid, long term?]<br>There is also a small opportunity to convert/maintain some transitional NT3 areas in the Beaverfoot Valley open forest conditions, maybe 2-300 hectares. |  |  |

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| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Habitat Supply Forecast |
|---|---|---|---|---|
| | H5. Manage regenerated stands in the vicinity of hydro reservoirs to create perching and nesting trees for both eagles and ospreys trees by<br>a) variable density thinning and<br>b) varied planting stock. | 5. [How many of these sites or total area needed?]<br>We can't rely on wildlife tree patches to maintain nest and perch opportunty through time as gaps in supply will occur when managing even aged one structured stands on 120/140 year rotations. Silviculturally, there is opportunity to manipulate stands possibly by variable density thinning and varied planting stock to create multi-structured stands that will include large dominants above the canopy of surrounding forests with the suitable habitat characteristic such as larger branching. | | |
| | H6. Maintain a mosaic of stand densities through variable density spacing of all stands. | 6. This strategy should be a goal district wide. A strategy such as multiple entry variable spacing should increase stand diversity by better resembling natural conditions and processes. This could also be a step closer to gaining old growth conditions at an earlier age. | | |
| | H7. Create lichen forage in younger stands. | 7. [Need more info? How much area in young stand lichen production is needed? What age stands are we targeting? How does this relate to H2?] | | |
| | H8. Rehabilitate 30 ha/yr of aspen stands to maintain deciduous cover. | 8. **About 30 ha/yr of aspen stand maintenance is occurring under the Columbia Basin Trust.** Treatment is felling/girdling @ $600/ha = $18,000/yr. | | |

# *Silviculture Strategy*

This section synthesizes the preceding background information, workshop discussion and subsequent analysis into an incremental silviculture strategy for the TSA.

## General Strategy

The primary focus of the silviculture strategy is to:

- increase regenerated stand volumes by 20%;
- accelerate the growth of stands currently aged 20-30 years to make them available for harvest at younger ages (i.e., at lower minimum harvest ages) in the period 60 to 80 years from now; and
- partially offset anticipated future lower log quality by spacing and pruning suitable young stands.

Accomplishing this strategy requires a program substantially above historic levels.

## Working Targets

The preceding analysis indicates the following working targets are attainable. Figure 12 illustrates these. Achieving these targets requires a substantially higher silviculture program level than in the past. The targets assume a status quo with respect to the TSR2 base case and the size of the timber harvesting land base. As these change, so will the targets.

| | |
|---|---|
| **WT 1 (Quantity)**: | Minimize the anticipated interim reduction in timber supply so that harvest levels of at least 0.46 million m3/yr can be achieved in this period. |
| **WT 2 (Quantity)**: | Manage long term timber supply to yield a steady harvest level of 0.54 million m3/yr. |
| **WT 3 (Quality)**: | Manage regenerated stands to yield at least 9% (by volume) premium large logs as well as 3% (by volume) clear logs, with the majority of the remainder being of sawlog quality. (The majority of clear logs will also be large logs.) |

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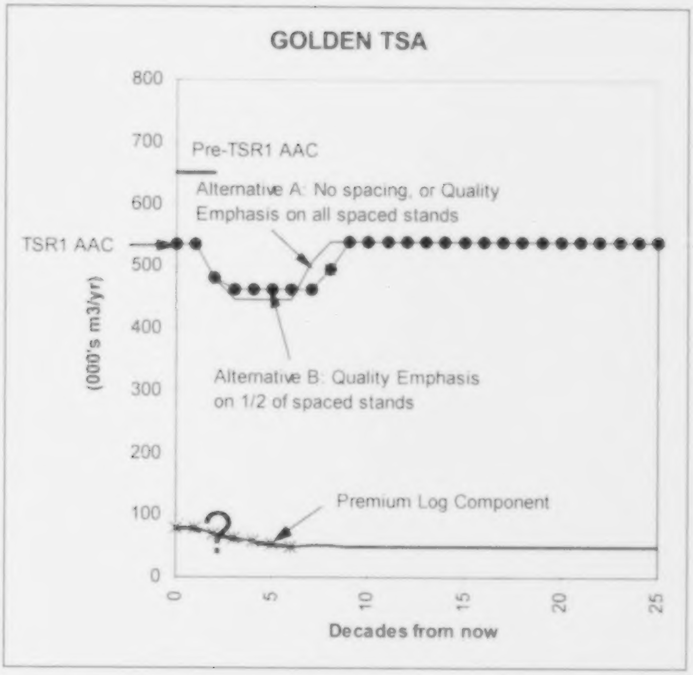

**Figure 12. Combined potential quantity and quality harvest forecasts, Golden TSA**

## Log Product Objectives

The following are (unapproved) product objectives at the log level for the Golden TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | | |
| Type III | All | 15% of stands having 32.5+ cm minimum average stand diameter at breast height (DBH), having 60-100% of stems with a 1st log clear of knots, and achieved through faster growth at lower stocking levels (600 sph at rotation). |
| Type IV | All | 15% of stands having 32.5+ cm minimum average stand diameter at breast height (DBH), having narrow ring width achieved through higher stand density (800 sph at rotation) and having 60-100% of stems with a 1st log clear of knots. |
| **Sawlog:** | All | 27.5+ cm minimum average stand DBH. |

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## Silviculture Strategies

The following strategies have identified potential to maintain and/or increase the quantity and quality of the timber supply of the Golden TSA. Strategy numbers correspond with those recorded earlier.

### ♦ Strategies to Increase the Quantity of Future Timber Supply

Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them.

These strategies are supported by specific silvicultural regimes, listed on page 56 along with investment priorities.

| No. | Strategy | Priority Ranking |
|---|---|---|
| General | Conduct silviculture surveys in support of all strategies. | 1 |
| ***Short Term*** | | |
| ST2 | Fertilize 450 ha/yr of suitable stands scheduled for harvest in the 2nd or later decades. (increase) | 5 |
| ***Mid Term*** | | |
| MT2 | Continue ST 2. | 5 |
| MT3 | (a) Reduce minimum harvest ages 10 years over the period 6 to 8 decades from now; and<br>(b) increase the volume of regenerated stands by 20% over those used at the base case minimum harvest age (LT impact);<br>through the following: | |
| | i) Expand the area planted with improved seedlings by 700 ha/yr - priority East Kootenay, mid-elevation lodgepole pine. (increase) | 2 |
| | v) Brush 400 ha/yr for growth enhancement and increased survival. (increase) | 4 |
| | vi) Space 350 ha/yr of dense stands (in addition to Q2 spacing) primarily in the Sue fire and Beaverfoot Valley areas to make them harvestable during the period 7 to 8 decades from now, overcoming an age class gap. (increase) | 3 |
| | vii) Manage 30 000 ha on a 15 yr return fertilization cycle of 2 000 ha/yr. | 6 |

| **No.** | **Strategy** | **Priority Ranking** |
|---|---|---|
| ***Long Term*** | | |
| LT1 | Maintain the THLB by: | |
| | (a) Fill-planting 300 ha of remaining treatable backlog NSR (maintain); and | 2 |
| | (b) Maintaining approx. 400 ha of previously reforested backlog plantations. (maintain) | 2 |
| LT3 | Continue MT 3. (increase) | See MT3 |
| LT4 | Reduce losses to root rot by: (maintain) | |
| | (a) planting alternate species; | Current Practice |
| | (b) pop-up spacing (20 ha/yr); | ? |
| | (c) pushover logging / stumping; and | Current Practice |
| | (d) mixed species planting. | Current Practice |
| LT6 | Continue MT 4. | Not Ranked |

- **Strategies to Increase the *Quality* of Future Timber Supply**

| **No.** | **Strategy** | **Priority Ranking** |
|---|---|---|
| Q1 | Two-lift prune 150 ha/yr (total 300 ha/yr) to 5.5 m to create knot-free timber in the lowest 5.0 m log. | 3 |
| Q2 | Space 300 ha/yr (in addition to MT3( to obtain large dimension timber and prepare stands for fertilization, pruning and/or commercial thinning. | 3 |

- **Strategies to Increase the *Quantity* or *Quality* of Future Habitat Supply**

The following strategies have identified potential to increase the quality or quantity of the habitat supply of the Golden TSA. These were identified in the district workshop. Also see MT4 for CT strategies for caribou and ungulate habitat.

| **No.** | **Strategy** | **Priority Ranking** |
|---|---|---|
| H1 | To be completed. | |

## Summary of Information and Research Needs

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for a silviculture strategy. Bracketed number refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 24).

1. Analysis of how much area is presently below green-up and time until green-up is required by landscape unit/resource management zone. (ST1)
2. Fertilization trials are needed in spruce and cedar stands to determine efficacy. (ST2)
3. Analysis required of the potential of recent plantations for future commercial thinning in the VQ zone (MT1).
4. TIPSY OAF 1 factor of 15% requires confirmation with respect to non-productive openings that are not typed out of forest stands, and with respect to basic brushing and brushing for growth. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (MT3 ii, v)
5. Assessment required of the 28 000 ha of stands aged 20-30 years as to what stocking levels will postpone the time to achieve the minimum piece size criteria (i.e., determine stocking threshold levels for spacing), and the occurrence of these stands (MT 3 vi).
6. FSSIM analysis is required to determine possible timber supply effect of lowering ages for caribou habitat from 250 to 200. (MT4)
7. Silvicultural activities, particularly commercial thinning, can be used to create old-growth tree attributes at earlier ages, thereby relieving some constraints. However, some other biological requirements may not be met. Further study is required to determine if CT can achieve these attributes earlier. (MT4)
8. Further analysis of options and opportunities for dealing with non-merchantable hemlock is required before a course of action can be selected. (LT2)
9. An expert inventory of low-site stands similar to the Merritt small wood study is needed to determine their true productivity and silvicultural opportunities, if any. (LT2)
10. Further study of root rot management techniques and options is needed. (LT4)
11. Old growth site index estimation studies require completion. It is anticipated that site indexes may be underestimated.
12. Need to determine whether it is more cost effective to prune more hectares, but less stems per hectare than to prune all stems on fewer hectares. (Q1)
13. Greater certainty regarding the timber harvesting land base is critical - resolve issues such as operability and ESA1 occurrence - before large pruning investments can be made. (Q1)

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# Silviculture Regimes and Investment Priorities

The following table indicates silviculture regimes which are suitable to attaining the above working targets and strategies.

|  |  |  | Timber Supply Effects |  |  |  |  | --------- Habitat --------- |  |  | Direct |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Strategy | Opportunity |  |  |  | Quality |  |  |  | Jobs | Cost | Revsd | Wkshp |
| Regimes |  | Area (Ha/Yr) | Short | Medium | Long | Clears | Density | Thermal | Forage | Days/ha | $/ha¹ | Rank | Rank |
| **Survey** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 Backlog and incremental |  | 8,000 |  |  |  |  |  |  |  | 0.1 | 30 |  | 1 |
| 2 Habitat opportunities |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Backlog** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 rehab (fill planting) | L1a | 300 | 0 | 0 | ++ | 0 | 0 | 0 | ++ | 1 | 600 |  | 2 |
| 4 brushing | L1b,L1a | 300 | + | 0 | ++ | 0 | 0 | 0 | +/- | 1.5 | 550 |  | 2 |
| **Pre FTG** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 brushing for growth | M3e, L3 | 400 | + | ++ | + | 0 | 0 | 0/+ | 0/+ | 1 | 400 |  | 4 |
| **Post FTG** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 space (wood flow- quantity) | M3vi, L3 | 350 | + | + | 0/+ | + | + | 0/+ | + | 2.5 | 800 |  | 3 |
| 11 space (quality) | Q1 | 350 | 0 | 0/- | 0/- | +++ | +++ | + | + | 2.5 | 800 |  | 3 |
| 12 **space (Ungulate habitat - prefer Fdi, Sw, Cw)** | H1,H2 | ? | 0 | + | 0 | + | + | +/- | +/- | 2.5 | 800 |  | 3 |
| 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| space (root rot)? | LT4 | 20 |  |  |  |  |  |  |  |  |  |  |  |
| 15 fertilize (space/repeat fert) | M3g,L3 | 2000 | 0 | + | + | + | + | 0 | 0 | 0.1 | 250 |  | 6 |
| 16 fertilize older, 2nd decade harvest | S2, M2 | 450 | + | + | + | + | + | 0 | 0 | 0.1 | 250 |  | 5 |
| 17 **fertilize (Ungulate habitat)** | H1,H2 | ? | 0 | 0 | 0 | + | + | + | + | 0.1 | 250 |  | 7 |
| 19 Prune (spaced) | Q1,Q2 | 300 | 0/- | 0/- | 0/- | +++ | +++ | 0 | 0 | 4 | 1000 |  | 3 |

# Silviculture Program

The following annualized program will contribute to achieving the above goals and strategies. This program is considerably above historic levels and some activities may require phasing in. Spacing and pruning goals represent an anticipated upper bound. Lesser program levels should be oriented to specific target stands as shown in the regime table.

**Program Table - Ha, Golden TSA, March 1999**

| Year | Surveys* | Fill Planting | Backlog Brushing | Brushing (for Growth) | Space | Prune | Fertilize |
|---|---|---|---|---|---|---|---|
| 1 | 8,000 | 300 | 300 | 400 | 700 | 300 | 2,450 |
| 2 | 8,000 | - | 300 | 400 | 700 | 300 | 2,450 |
| 3 | 8,000 | - | 200 | 400 | 700 | 300 | 2,450 |
| 4 | 8,000 | - | 200 | 400 | 700 | 300 | 2,450 |
| 5 | 8,000 | - | 100 | 400 | 700 | 300 | 2,450 |
| Subtot Yr 1 - 5 | 40,000 | 300 | 1,100 | 2,000 | 3,500 | 1,500 | 12,250 |
| 6 - 10 | 40,000 | - | - | 2,000 | 3,500 | 1,500 | 12,250 |
| Total Yr 1 - 10 | 80,000 | 300 | 1,100 | 4,000 | 7,000 | 3,000 | 24,500 |

* Includes prescription and layout

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unit cost ($/ha) | 30 | 600 | 550 | 400 | 800 | 1,000 | 250 |

**Program Table - $ 000s, Golden TSA, March 1999**

| Year | Surveys* | Fill Planting | Backlog Brushing | Brushing (for Growth) | Space | Prune | Fertilize | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 240 | 180 | 165 | 160 | 560 | 300 | 613 | 2,218 |
| 2 | 240 | - | 165 | 160 | 560 | 300 | 613 | 2,038 |
| 3 | 240 | - | 110 | 160 | 560 | 300 | 613 | 1,983 |
| 4 | 240 | - | 110 | 160 | 560 | 300 | 613 | 1,983 |
| 5 | 240 | - | 55 | 160 | 560 | 300 | 613 | 1,928 |
| Subtot Yr 1 - 5 | 1,200 | 180 | 605 | 800 | 2,800 | 1,500 | 3,063 | 10,148 |
| 6 - 10 | 1,200 | - | - | 800 | 2,800 | 1,500 | 3,063 | 9,363 |
| Total Yr 1 - 10 | 2,400 | 180 | 605 | 1,600 | 5,600 | 3,000 | 6,125 | 19,510 |

# Job Outcomes

The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets.

**Program Job Outcomes, Golden TSA, March 1999**

***Short term*** *employment associated with undertaking the silviculture activity, in person years*

| Year | Surveys | Fill Planting | Backlog Brushing | Brushing (for Growth) | Space | Prune | Fertilize | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 4.0 | 1.5 | 2.3 | 2.0 | 8.8 | 6.0 | 1.2 | 25.7 |
| 2 | 4.0 | - | 2.3 | 2.0 | 8.8 | 6.0 | 1.2 | 24.2 |
| 3 | 4.0 | - | 1.5 | 2.0 | 8.8 | 6.0 | 1.2 | 23.5 |
| 4 | 4.0 | - | 1.5 | 2.0 | 8.8 | 6.0 | 1.2 | 23.5 |
| 5 | 4.0 | - | 0.8 | 2.0 | 8.8 | 6.0 | 1.2 | 22.7 |
| Subtot Yr 1 - 5 | 20.0 | 1.5 | 8.3 | 10.0 | 43.8 | 30.0 | 6.1 | 119.6 |
| 6 - 10 | 20.0 | - | - | 10.0 | 43.8 | 30.0 | 6.1 | 109.9 |
| Total Yr 1 - 10 | 40.0 | 1.5 | 8.3 | 20.0 | 87.5 | 60.0 | 12.3 | 229.5 |

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job (Source Golden TSR2 SEA)

***Long term*** *employment associated with improved quality and quantity of the timber resource*[1]

| Decade | Harvest Increment ('000 m3) | Incremental Jobs per year by decade TSA[2] | Prov[3] | Total by decade TSA[2] | Prov[3] |
|---|---|---|---|---|---|
| 1 | - | - | - | - | - |
| 2 | 54 | 84 | 152 | 840 | 1,519 |
| 3 | 89 | 140 | 253 | 1,397 | 2,528 |
| 4 | 89 | 140 | 253 | 1,397 | 2,528 |
| 5 | 89 | 140 | 253 | 1,397 | 2,528 |
| 6 | 62 | 98 | 177 | 977 | 1,768 |
| 7 | 62 | 98 | 177 | 977 | 1,768 |
| 8 | 95 | 149 | 270 | 1,492 | 2,698 |
| 9 | 95 | 149 | 270 | 1,492 | 2,698 |
| 10 | 95 | 149 | 270 | 1,492 | 2,698 |
| 11 | 95 | 149 | 270 | 1,492 | 2,698 |
| 12 | 95 | 149 | 270 | 1,492 | 2,698 |
| 13 | 95 | 149 | 270 | 1,492 | 2,698 |
| 14 | 95 | 149 | 270 | 1,492 | 2,698 |
| 15 | 95 | 149 | 270 | 1,492 | 2,698 |
| 16 | 95 | 149 | 270 | 1,492 | 2,698 |
| 17 | 95 | 149 | 270 | 1,492 | 2,698 |
| 18 | 95 | 149 | 270 | 1,492 | 2,698 |
| 19 | 95 | 149 | 270 | 1,492 | 2,698 |
| 20 | 95 | 149 | 270 | 1,492 | 2,698 |
| 21 | 95 | 149 | 270 | 1,492 | 2,698 |
| 22 | 95 | 149 | 270 | 1,492 | 2,698 |
| 23 | 95 | 149 | 270 | 1,492 | 2,698 |
| 24 | 95 | 149 | 270 | 1,492 | 2,698 |
| 25 | 95 | 149 | 270 | 1,492 | 2,698 |
| Total | | | | 33,834 | 61,202 |

Notes:

1. Assumes continuation of the silviculture program beyond the first 10 years, in accordance with the strategy. The total harvest increment is associated with all the silvicultural practices documented in the "Opportunities" section and is only partly attributable to spacing and fertilization practices. Some of the increase may be associated with pre-free growing silviculture that was not current practice at the time of TSR2.

2. Assumes 1.57 TSA level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre (Source: TSR2 SEA Table 12, p.69)

3. Assumes 2.84 Province level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre (Source: TSR2 SEA Table 12, p.69)

# References

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# Abbreviations

The following abbreviations are used.

| | |
|---|---|
| AAC | allowable annual cut |
| CF | chief forester |
| CT | commercial thinning |
| DBH | diameter at breast height |
| ESSF | engelmann spruce - subalpine fir (ecological zone) |
| FCC | forest cover constraints |
| FG | free growing |
| FRBC | Forest Renewal BC |
| ICH | interior cedar-hemlock (ecological zone) |
| IHL | initial harvest level |
| IRM | integrated resource management |
| KBLUP | Kootenay-Boundary Land Use Plan |
| LT | long term |
| LTHL | long term harvest level |
| MoF | Ministry of Forests |
| MS | montane spruce (ecological zone) |
| MT | mid term |
| NCBr | non-commercial brush |
| NSR | not satisfactorily restocked |
| OAF | operational adjustment factor |
| OLB | operable land base |
| SBFEP | small business forest enterprise program |
| SI | site index |
| SPH | stems per hectare |
| ST | short term |
| TFL | tree farm licence |
| THLB | timber harvesting land base |
| TIPSY | table interpolation program for stand yields |
| TSA | timber supply area |
| TSR | timber supply review |
| VDYP | variable density yield projection |
| VQO | visual quality objective |
| WT | working target |

Species abbreviations: B or Ba - balsam fir; Cw - western redcedar; Fd - Douglas-fir; Fdi - interior Douglas-fir; Hw - western hemlock; Pl - lodgepole pine; S - spruce species.

Site class abbreviations: G - good; M - medium; P - poor.

Draft

# Appendix A: Additional Document Detail

| Section | Source | Prepared |
|---|---|---|
| Strategy at a Glance | Executive Summary - captures the essence of the final silviculture strategy. | Post - workshop. |
| Basic Data | Timber Supply Review reports. | Pre-workshop. |
| Issues | | |
| - Individual Issue Analysis | Consultant's review and analysis of available documentation, mostly Timber Supply Review reports, in advance of preparing potential strategies for workshop discussion. | Pre-workshop. |
| - Illustration of Issues and Silvicultural Opportunities | Charts - timber supply review, prepared pre-workshop as a Powerpoint presentation to facilitate workshop discussion of issues and opportunities. | Pre-workshop, workshop, post-workshop. |
| | Commentary - added post workshop but largely illustrates the findings of the individual issue analysis. May incorporate some workshop findings. | |
| - Summary of Issues by Period | Prepared in advance of the workshop as a summary of the timber supply dynamics of the management unit, to facilitate development of potential strategies for workshop discussion. May be amended post-workshop to incorporate new insights, findings resulting from the workshop review. | Mostly pre-workshop. Some post-workshop. |
| Incremental Silviculture History | Past history - Timber Supply Review. Current history - workshop participants. | Pre-workshop, workshop. |
| Higher Level Goals and Objectives | Ministry of Forests documents - see references | Pre-workshop. |
| Opportunities to Increase Timber Supply | | |
| - Potential Strategies | Consultant's proposals, based on the issue analysis, to facilitate workshop discussion. Strategy numbers are carried throughout the documentation for tracking purposes. Potential strategies can be related back to the Silvicultural Opportunities columns of the issue analysis. | Pre-workshop. |

| **Section** | **Source** | **Prepared** |
|---|---|---|
| - Workshop Review of Potential Strategies | Documentation of the workshop session. | Workshop |
| - Potential Harvest Forecast | Consultant's illustration of strategy potential based on workshop results. | Post workshop. |
| Opportunity to Improve Timber Quality | Note: The lack of available information on timber quality and habitat supply limited pre-workshop development of these aspects of the strategy. | |
| Product Objectives | District's statement of objectives and workshop discussion. | Pre-workshop, workshop. |
| Potential Strategies | Partially consultant's proposals to facilitate workshop discussion. Mostly developed in the workshop. Strategy numbers are carried throughout the documentation for tracking purposes. | Some pre-workshop, mostly workshop. |
| Large Premium Log Analysis | Prepared by consultant in advance of workshop to facilitate workshop discussion. Modified afterwards to reflect workshop strategies. | Pre-workshop, workshop, post-workshop. |
| Potential Quality Forecast | Consultant's illustration of strategy potential based on workshop results. | Post workshop. |
| Opportunities to Improve Habitat Supply | Proposed by workshop participants. Incorporates post workshop commentary by MoELP. | Workshop, post-workshop. |
| Silviculture Strategy | Summation of the findings of the workshop, translated into a strategy. Only those potential strategies deemed feasible by workshop participants are kept. Strategy numbers correspond with those initially proposed for tracking purposes (which are founded in the issue analysis). Strategies are ranked in keeping with the treatment rankings of the regime table. | Post workshop. |
| Silviculture Regimes and Investment Priorities | Prepared during the workshop. Recorded here as part of the final strategy (rather than under the workshop) to avoid unnecessary duplication. | Workshop. |
| Silviculture Program | Basic program elements prepared during the workshop. Program developed later by consultants. | Workshop, post workshop. |
| Job Outcomes | Basic factors from workshop participants. Calculations performed later by consultants. | Workshop, post workshop. |

## Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at
http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement.
The template design allows completion in a consistent format for all management units across the province.
Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** Golden TSA

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# Golden TSA
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

## Activities

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 50 | 50 | 50 | 50 | 0.00 | 0 |
| Spacing | 0 | 10 | 10 | 10 | 10 | 0.00 | 0 |
| Pruning | 0 | 6 | 6 | 6 | 6 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 66 | 66 | 66 | 66 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |

## Forest Health Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Habitat Supply and Biodiversity Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Domestic Range

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Enhanced Forestry Activities - Management Unit Total

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surveys | 0 | 50 | 50 | 50 | 50 | 0.00 | 0 |
| Spacing | 0 | 10 | 10 | 10 | 10 | 0.00 | 0 |
| Pruning | 0 | 6 | 6 | 6 | 6 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 66 | 66 | 66 | 66 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |

12/5/2005

# Golden TSA
## Backlog Program Table
## For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Legal Obligations** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 1817 | 1071 | 1741 | 1024 | 609 | 27.50 | 49968 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 15 | 16 | 0 | 0 | 0 | 880.00 | 13200 |
| Brushing | 229 | 265 | 211 | 100 | 100 | 660.00 | 151140 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 2061 | 1352 | 1952 | 1124 | 709 | 103.98 | 214,308 |
| Seed purchase | 0 | 12800 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 214,308 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 500 | 500 | 500 | 500 | 500 | 27.50 | 13750 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 500 | 500 | 500 | 500 | 500 | 27.50 | 13,750 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total backlog reforestation** | | | | | | | 13,750 |
| **Impeded areas** | | | | | | | |
| Surveys | 1224 | 500 | 500 | 500 | 500 | 27.49 | 33653 |
| Brushing | 200 | 200 | 200 | 200 | 200 | 880.00 | 176000 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 1424 | 700 | 700 | 700 | 700 | 147.23 | 209,653 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 209,653 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 0 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 3541 | 2071 | 2741 | 2024 | 1609 | 27.50 | 97371 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 15 | 16 | 0 | 0 | 0 | 879.82 | 13200 |
| Brushing | 429 | 465 | 411 | 300 | 300 | 762.56 | 327140 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 3985 | 2552 | 3152 | 2324 | 1909 | 109.84 | 437711 |
| Seed purchase | 0 | 12800 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning | | | | | | | 0 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 437,711 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

**Golden TSA**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

## *The following default provincial factors may be replaced by management unit specific factors.*

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 15 | | |
| Enter area of all other sites planted with improved trees | 400 | | |
| Total area affected by tree improvement | 415 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 12,000 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 3,541 |
| 33% of all silviculture surveys | | | 1,169 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 1,169 |

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)

| | | | |
|---|---|---|---|
| Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | 150 |

| Improve-ment | Seedling Production | Surveys | Preparation | Plant | | | | | staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 |

**Years the factor will affect:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest** 5-15% | 15-30% | 1-5%

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## ***Area affected by tree improvement, seedling production and silviculture surveys***

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.

The following additional information is needed for tree improvement, seedling production and silviculture surveys

| Area | | |
|---|---|---|
| Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys |

**A Tree improvement**

**Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002**

| | |
|---|---|
| Backlog area planted from backlog table | 15 |
| Enter area of all other sites planted with improved trees | 400 |
| Total area affected by tree improvement | 415 |

**B Nursery production of seedlings**

Enter sowing requests from SPAR 12,000

**C Silviculture surveys**

Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.

These potentially provide improved estimates of site productivity and operational yield adjustment factors

| | |
|---|---|
| Total EFP surveys from the EFP table | 0 |
| Total backlog surveys from the backlog table. | 3,541 |
| 33% of all silviculture surveys | 1,169 |

**Optionally, you may provide a more exact estimate:**

| | |
|---|---|
| Estimate area of regen delay surveys | |
| Estimate area of free growing surveys | |
| Estimate area of pre-stand tending surveys | |
| Estimate of total surveys that will affect timber supply | (A) 0 |

Surveyed area that will affect timber supply

Replace with (A) if a more exact estimate is calculated 1,169

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)

Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 150

Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)

Estimate area that will be classified as free growing after a survey in 2001/2002 755

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity. 0

# Golden TSA
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improve-ment | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 415 | 12,000 | 1,169 | 0 | 15 | 429 | 0 | 0 | 0 | 14,028 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 11,060 | 0 | 35,167 | 0 | 2,048 | 6,971 | 0 | 0 | 0 | | 55,246 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 150 | | | | | | | | 150 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 755 | | | | | | | | 755 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 42 | 4,080 | 117 | 0 | 30 | 1,120 | 0 | 0 | 0 | 1,403 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 23 | 1 | 0 | 0 | 6 | 0 | 0 | 0 | 8 | 38 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# Golden TSA
# Management Unit Summary Table
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 0 | 66 | 66 | 66 | 66 | 0 | 0 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| Backlog Program Field Activities | 3,985 | 2,552 | 3,152 | 2,324 | 1,909 | 110 | 437,711 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| **Totals** | 3,985 | 2,618 | 3,218 | 2,390 | 1,975 | | 437,711 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 55,246 $m^3$ |
| Estimated ha that will be reclassified as stocked | 150 ha |
| Estimated ha that will be declared as free growing | 755 ha |
| Estimated total full time equivalent positions generated | 38 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

## Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at
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c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here**: Invermere TSA

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

12/5/2005

# Invermere TSA
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) | |
| Surveys * | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Spacing | 630 | 397 | 264 | 307 | 300 | 664.29 | 418503 | Repression spacing |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 630 | 397 | 264 | 307 | 300 | 664.29 | 418,503 | |
| Planning and prescriptions * | | | | | | | 0 | |
| **Total dollars** | | | | | | | 418,503 | |

* included in total spacing costs

| **Forest Health Enhancement** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

| **Habitat Supply and Biodiversity Enhancement** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

| **Domestic Range** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

| **Enhanced Forestry Activities - Management Unit Total** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 630 | 397 | 264 | 307 | 300 | 664.29 | 418,503 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 630 | 397 | 264 | 307 | 300 | 664.28 | 418,503 |
| Planning and prescriptions | | | | | | | 0 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 418,503 |

# Invermere TSA
## Backlog Program Table
## For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) | |
| **Legal Obligations** | | | | | | | | |
| Surveys | 139 | 55 | 128 | 226 | 0 | 28.66 | 3984 | |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Planting | 128 | 226 | 0 | 0 | 0 | 1,274.00 | 163200 | incl. $67,200 for netting |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 267 | 281 | 128 | 226 | 0 | 625.92 | 167,184 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Total legal obligations** | | | | | | | 167,184 | |
| **Backlog Reforestation** | | | | | | | | |
| Surveys | 1802 | 9414 | 5599 | 1071 | 1218 | 28.66 | 51652 | |
| Site preparation | 21 | 0 | 0 | 0 | 0 | 680.00 | 14280 | |
| Planting | 0 | 50 | 275 | 300 | 100 | 0.00 | 0 | |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 1823 | 9464 | 5874 | 1371 | 1318 | 36.17 | 65,932 | |
| Seed purchase | 271000 | 280000 | 0 | 0 | 0 | 0.33 | 89,496 | |
| Prescriptions and planning dollars | | | | | | | 0 | |
| **Total backlog reforestation** | | | | | | | 155,428 | |
| **Impeded areas** | | | | | | | | |
| Surveys | 200 | 0 | 0 | 0 | 0 | 100.00 | 20000 | maintenance of netted areas |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 200 | 0 | 0 | 0 | 0 | 100.00 | 20,000 | |
| Prescriptions and planning dollars | | | | | | | 0 | |
| **Total impeded areas** | | | | | | | 20,000 | |
| **Site Restoration** | | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Prescriptions and planning dollars | | | | | | | 0 | |
| **Total site restoration** | | | | | | | 0 | |
| **Backlog Program Activities - Management Unit Total** | | | | | | | | |
| Surveys | 2141 | 9469 | 5727 | 1297 | 1218 | 35.33 | 75636 | |
| Site preparation | 21 | 0 | 0 | 0 | 0 | 679.94 | 14280 | |
| Planting | 128 | 276 | 275 | 300 | 100 | 1,273.97 | 163200 | |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | |
| **Totals hectares** | 2290 | 9745 | 6002 | 1597 | 1318 | 110.53 | 253116 | |
| Seed purchase | 271000 | 280000 | 0 | 0 | 0 | 0.33 | 89496 | |
| Prescriptions and planning | | | | | | | 0 | |
| **Recommended studies** | | | | | | | 0 | |
| **Total backlog program** | | | | | | | 342,612 | |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify

12/5/2005

**Invermere TSA**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

***The following default provincial factors may be replaced by management unit specific factors.***
The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.
**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.
**Provincial factors for estimated value gain at harvest**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.
**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

***Area affected by tree improvement, seedling production and silviculture surveys***
Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | **Tree Improvement** | **Nursery Seedling Production** | **Silviculture Surveys** |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 128 | | |
| Enter area of all other sites planted with improved trees | 79 | | |
| Total area affected by tree improvement | 207 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 317,350 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 2,141 |
| 33% of all silviculture surveys | | | 707 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | 412 |
| Estimate area of free growing surveys | | | 1,729 |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | | (A) 2,141 |
| Surveyed area that will affect timber supply | | | |
| Replace with (A) if a more exact estimate is calculated | | | 707 |

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)

| | |
|---|---|
| Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | 100 |

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 128 | | |
| Enter area of all other sites planted with improved trees | 79 | | |
| Total area affected by tree improvement | 207 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 317,350 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.<br>These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 2,141 |
| 33% of all silviculture surveys | | | 707 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | 412 |
| Estimate area of free growing surveys | | | 1,729 |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 2,141 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 707 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)<br>Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | 100 |
| Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)<br>Estimate area that will be classified as free growing after a survey in 2001/2002 | | | 1,285 |

**Habitat Supply**
Melp staff professional judgement used to estimate this performance measure
Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity. ☐

# Invermere TSA
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 207 | 317,350 | 707 | 21 | 128 | 0 | 630 | 0 | 0 | 319,043 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 5,514 | 0 | 21,263 | 0 | 17,486 | 0 | 0 | 0 | 0 | | 44,263 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 100 | | | | | | | | 100 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 1,285 | | | | | | | | 1,285 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 21 | 107,899 | 71 | 21 | 256 | 0 | 2,495 | 0 | 0 | 31,904 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 599 | 0 | 0 | 1 | 0 | 14 | 0 | 0 | 177 | 793 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# Invermere TSA
# Management Unit Summary Table
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 630 | 397 | 264 | 307 | 300 | 664 | 418,503 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| Backlog Program Field Activities | 2,290 | 9,745 | 6,002 | 1,597 | 1,318 | 111 | 253,116 |
| Planning, prescriptions and seedlings | | | | | | | 89,496 |
| **Totals** | 2,920 | 10,142 | 6,266 | 1,904 | 1,618 | | 761,115 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 44,263 $m^3$ |
| Estimated ha that will be reclassified as stocked | 100 ha |
| Estimated ha that will be declared as free growing | 1,285 ha |
| Estimated total full time equivalent positions generated | 793 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

# Kootenay Lake
# Timber Supply Area

## Interim Silviculture Strategy

-- Version 1.1 --

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Contents

STRATEGY AT A GLANCE ....................................i
Introduction....................................................3
Basic Data.......................................................4
Issues ............................................................5
Incremental Silviculture History ...........................18
Higher Level Goals and Objectives .........................18
Opportunities to Increase Timber Supply ................20
Opportunities to Improve Timber Quality ................34
Incremental Silviculture Strategy..........................38
Silviculture Regimes and Investment Priorities .......43
Incremental Silviculture Program ..........................45
Job Outcomes.................................................46
References.....................................................47
Abbreviations..................................................47

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**British Columbia**

**Ministry of Forests**

**Funded By**

Forest Renewal BC

**January 15, 1999**

# STRATEGY AT A GLANCE

*General Strategy*

Better resource information and accelerated tree improvement offer the two greatest possibilities for increasing future harvest levels in the Kootenay Lake TSA. The first may result in an increased land base, while the second will shorten green-up periods as well as increase regenerated stand volumes.

Elimination of the NSR backlog was assumed in the TSR1 base case and its accomplishment is necessary to maintain that forecast and the AAC on which it was founded.

Spacing will improve the future quality of the timber resource and should also be used to set up stands for future commercial thinning. Commercial thinning may offer opportunities to restructure the harvest queue, thereby assisting in overcoming adjacency limitations and increasing the harvest level during the critical time period 3-5 decades from now. Further analysis is required to confirm the CT potential as well as determine target stands.

Reducing losses to root rot is being addressed through silviculture prescriptions and actions required under the Forest Practices Code. Incremental silviculture activities can supplement this to bring losses to reasonable levels.

*Working Targets*

**Quantity**: Manage long term timber supply to yield harvest levels of 650 million m3/yr.

**Quality**: Manage regenerated stands to yield at least 10% premium logs by volume, with the majority of the remainder being of sawlog quality.

*Product Objectives*

| Quality Class | Species | Characteristics |
|---|---|---|
| Premium Log: | Douglas-fir, lodgepole pine, larch | suitable for achieving machine stress rated (MSR) lumber grading - grown in higher density stands (slower growth rate less of an issue than density) |
| | Douglas-fir, spruce peelers | clear or few tight knots. |
| | white pine, clear | 17.5+ cm min diameter at breast ht (DBH), manually or naturally pruned, min 5.2 m log. |
| | cedar, tight knot or clear | 30+ cm min DBH, naturally pruned. |
| | white pine, large timber | 40+ cm min DBH, unpruned. |
| | lodgepole pine, large timber | 30+ cm min DBH, 15 m min length, 20 cm + top. |
| | spruce, large timber | 45+ cm min DBH. |
| Sawlog: | Minimum average stand DBH of 17.5 cm and min. stand vol. of 150 m3/ha. | |

## *Major Silvicultural Strategies*

### Quantity

(Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness.)

1. Overcome forest cover constraints by reducing time to green-up through the use of large improved stock, and implementing a regime of spacing 200 ha/yr and fertilizing 60 ha/yr of spaced stands (both commencing immediately) and commercial thinning (commencing in about 30 years) in all zones, particularly in the visual quality zone.

*Further analysis is required to refine the spacing/commercial thinning strategy and locate target stands.*

2. (a)Rehabilitate all remaining treatable backlog NSR - 1 800 ha; and

(b) maintain 5 000 ha of existing backlog plantations.

3. Increase the timber harvesting land base by:

(b) converting /rehabilitating 5 000 ha of deciduous stands;

(d) inventorying low site stands to determine if correctly classified and to enable development of silvicultural strategies to improve the productivity of some stands.

4. Reduce losses to root rot through pop-up spacing 100 ha/yr (other solutions lie within the basic silviculture domain).

5. Increase the volume of regenerated stands 15% by:

   (a) using genetically improved stock;

   (e) brushing for growth enhancement

   (l) 2nd lift pruning 100ha/yr of white pine to reduce blister rust losses.

### Quality

1. Space 500 ha/yr to obtain large dimension timber and prepare stands for fertilization.

## *Incremental Silviculture Program*

*(ha)*

| Year | Surveys | Backlog Planting | Backlog Brushing | Conversion | Space | Fertilize | Prune |
|---|---|---|---|---|---|---|---|
| 1 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| 2 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| 3 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| 4 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| 5 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| Subtot Yr 1 - 5 | 91,800 | 1,800 | 5,000 | 500 | 4,000 | 800 | 500 |
| 6 - 10 | 91,800 | - | 3,750 | 500 | 4,000 | 800 | 500 |
| Total Yr 1 - 10 | 183,600 | 1,800 | 8,750 | 1,000 | 8,000 | 1,600 | 1,000 |

* Includes prescription and layout

# Introduction

## About the Interim Strategy

Incremental silviculture is part of a suite of strategies which together may influence the future quality and quantity of habitat and timber supply. This strategy document broadly analyzes the full potential range of silviculture activities in order to create a context for an incremental silviculture strategy.

An incremental silviculture strategy should not be confused with the allowable annual cut (AAC)[1] determination process. AAC's are based on actual practice and current information at the time of the determination. This strategy, on the other hand, is about creating a future state of our forests. The degree to which the strategy proves appropriate and is achieved may influence future, but not necessarily present, AAC determinations.

This strategy is founded on readily available information and the knowledge of forestry professionals. It is intended as an interim strategy until a more in-depth analysis-based review is completed.

## Methodology

This strategy was prepared through the following process:

1. Prior to the district working session, L. P. Atherton & Associates prepared a preliminary draft of this document, summarizing all available information relevant to a strategy and identifying opportunities to improve the future quantity and quality of timber supply.
2. A district workshop was held November 23 & 24, 1998 in Nelson, attended by representatives of the MoF and forest licensees of the Kootenay Lake Timber Supply Area (TSA). Because the session was also a demonstration of the methodology, licensee representatives from outside the TSA also attended. Larry Atherton of L. P. Atherton & Associates and Doug Williams of Cortex Consultants Inc. led the session. Participants reviewed the potential opportunities identified in the draft document along with others that arose. The outcome of the session was a regime table, complete with priorities.
3. The consultants incorporated the results of the working session into the draft document and added forecasts of future harvest quantity and quality and of job outcomes.
4. After Ministry of Forests' (MoF) review, the consultants submitted a completed strategy document to the MoF in electronic format as version 1.0. (The ministry will assign higher version numbers (e.g., 1.1, 1.2, etc.) as the strategy evolves and changes are made.)

## Acknowledgments

The participation of representatives of the following organizations at the district working session is gratefully acknowledged.

*Ministry of Forests:*

- Kootenay Lake Forest District;
- Nelson Forest Region.
- Forest Practices Branch, Victoria

*Forest licensees of the Kootenay Lake TSA:*

- Pope & Talbot
- Wynndel Box
- Kalesnikoff Lumber
- Crestbrook Forest Industries
- Slocan Forest Products

The project was directly managed by Ivan Listar of the Ministry of Forests, Nelson Forest Region. Funding was provided by Forest Renewal BC under a contract between the Ministry of Forests, Victoria (administered by Ralph Winter, Forest Practices Branch) and Cortex Consultants, Inc.

---

[1] See "Abbreviations," page 47 for a full listing of abbreviations used.

# *Basic Data*

## Land Area

| Description | Area (ha) | Area % |
|---|---|---|
| Total Area of TSA | 1 018 400 | 100 |
| Total Productive Crown Forest | 502 500 | 49 |
| Net Timber Harv. Land Base | 233 800 | 23 |

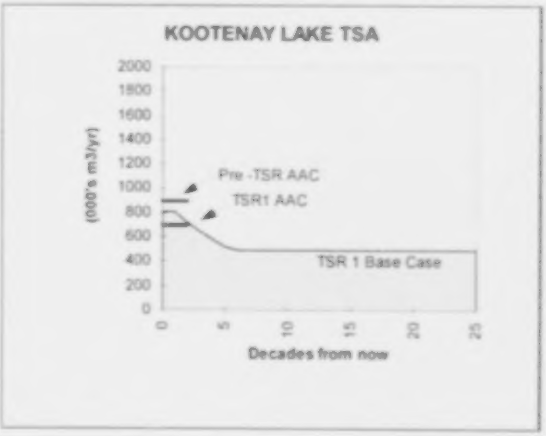
Source: TS analysis report - rounded to nearest 100 ha.

## AAC

| AAC Type | Pre-TSR | TSR1* | Change (%) |
|---|---|---|---|
| Conventional | 900 000 | 700 000 | -22.2 |
| Deciduous | - | - | |
| Insect/Disease | - | - | |
| Marginal | - | - | |
| Total | 900 000 | 700 000 | -22.2 |
| Woodlot AAC | | | |

*effective June 1/95

## Harvest Forecast

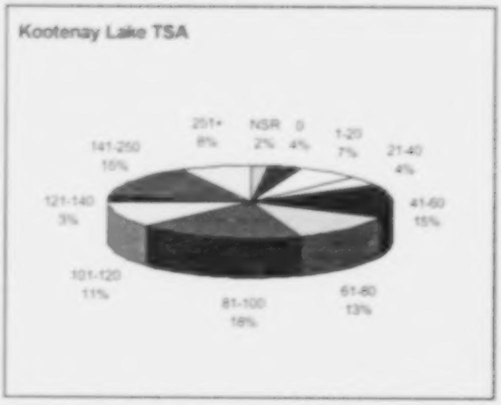


## Site Class

Kootenay Lake TSA

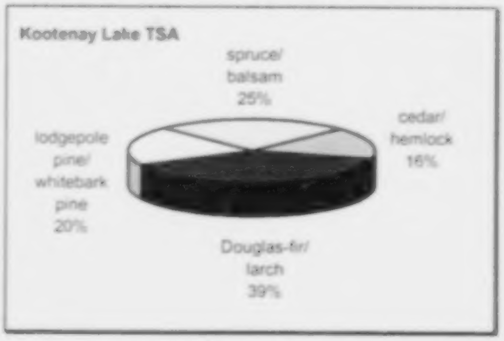
DATA NOT AVAILABLE

## Age Class



Data scaled from chart in TS analysis report.

## Tree Species



Data from chart in TS analysis report.

## *Issues*

### Individual Issue Analysis

The following information is primarily from documentation produced under the first timber supply review, or TSR1. Sources are noted, with full references given on page 47. Only information which is relevant to an incremental silviculture strategy is recorded. Key statements are bolded.

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| • Harvest Forecast | The starting harvest level of 803 000 m3/yr (11% below the pre-TSR allowable annual cut (AAC) of 900 000 m3/yr) can be maintained for 2 decades. This is followed immediately by 5 successive declines of *10%/decade to a long term* harvest level of 490 000 m3/yr (46% below the pre TSR AAC, 40% below the initial harvest level (IHL)) reached at the start of decade 7 (i.e., 60 years from now). (analysis, 13-14)<br>The first regenerated stands become available for harvest after 10 decades, but the available area is limited. Beginning in decade 14, more second-growth stands become mature and the amount of available timber increases. (analysis, 13).<br>Forest cover guidelines cause most of the timber to be harvested well beyond minimum harvest age. Overall, growing stock decreases only 29% over a 400 year horizon. (analysis, 13)<br>The 3rd and 4th decades are the most difficult for timber supply. In decades 2 - 6, one or both of the green-up or old growth forest cover guidelines are at their limit in all zones. (analysis, 13) In decade 3, constraints on harvesting older forests **cause harvesting to shift into younger, lower vol/ha stands**. Consequently, the area harvested by the model increases sharply in this decade. After the 3rd decade, the area harvested/yr declines mainly due to the decrease in harvest levels projected for decades 4 to 8. As harvesting shifts more into regenerated stands after decade 8, avg area harvested again rises due to the lower average volumes of these stands. (analysis, 17)<br>**Average harvest age falls steeply over the first 3 decades, thereafter stabilizing in the 150-200 year range** (analysis, 18). | Variable density yield projection system (VDYP) yields were used for regenerated stands. Thus regen stand volumes are underestimated by 15%-35% (presence of root rot makes estimates difficult). Min harvest ages may be considerably younger than used in the analysis but this may not matter because forest cover constraints (FCC's) limit harvest to well beyond min ages. At these older ages, volumes of managed stands may be considerably higher than unmanaged stands. | Decade 3 appears pivotal and may be governed by min ages. What would happen if min ages about this time were reduced? Is there anything silviculturally that could be done to assist this time period? | |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | Theoretical long term harvest level (LTHL), after allowing for fire and other losses is about 612 000 m3/yr, 25% above the forecast LTHL. (analysis, 14) | | | |
| ◆ Age Class | Only 23 % of stands are older than 140 years. 46% are between 70 and 140 years of age, the range of minimum harvestable ages. A large amount of timber is, or soon will be, available for harvest. However, after this inventory is drawn down over the next 50 years, the forest cover guidelines cause a significant amount of old growth to build up over time. (analysis, 15)<br>Over the planning horizon, **a significant amount of area remains over 140 years of age at all times**, because the forest cover guidelines extend the age at which stands are harvested. (analysis, 15) | | The large amount of area between 7-140 yrs of age causes problems for FCC's. Candidates for commercial thinning (CT)? | |
| ◆ Silvicultural Systems | About 75% of annual area harvested is under a clearcut silvicultural system (paper, 6), with the other 25% partially harvested (rationale, 26). Analysis incorporates regen delays of 5 - 8 yrs to incorporate the effects of brush competition. Chief forester (CF) acknowledges some delays are over-estimated (rationale, 19) and considers the effect of this on green-up delays in the AAC determination (rationale, 46). | | | |
| ◆ Backlog NSR | All backlog NSR (6 133 ha), with the exception of 820 ha which cannot be treated without the use of herbicides, will by treated by the year 2000 (net 5 313 ha) (rationale, 19-20). Analysis assumed will be restocked within 20 years (analysis, 54). ( NB: preceding info is TSR1 estimate. For more recent estimates, see "Incremental Silviculture History," page 18. | | | Failure to rehabilitate would result in a lower base case forecast. |
| ◆ Land Base | 53 569 ha (equiv to 18% of THLB) deducted as:<br>• low quality sites (32 471 ha - equiv to 11% of THLB);<br>• deciduous (11 547 ha - equiv to 4% of THLB);<br>• non-commercial cover (4 593 ha - equiv to 1.5% of THLB); and<br>• low volume stands (4 958 ha - equiv to 1.5% of THLB).<br>No land base sensitivity test reported in the analysis. CF reports a 10% decrease in THLB would result in a 5-10% lower IHL depending upon which harvest forecast is considered (rationale, 18). | Analysis in other TSA's generally show a 1% corresponding increase or decrease in LTHL for every 1% increase or decrease in THLB. Short term response to a THLB increase depends on amount of timber that can be recovered during rehab/conversion. In this | Rehabilitate/convert deciduous (often in riparian areas) and/or non-merch types?<br>Fertilize low productivity stands?<br>Does old growth site index (OGSI) have impact on low-site cut- | |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | | TSA, could be a measurable short term response as all categories except non-commercial cover (NCC) have timber on them. | off? What about use of Table Interpolation Program for Stand Yields (TIPSY) yields vs VDYP? | |
| ◆ Forest Cover | *Wildlife zones* ( % of THLB) allow a max of 33% of the area < 20 yrs of age and require a minimum of between 30-60% of stands must be greater than 46 yrs of age, except for the early winter zone which requires 50% to be greater than 120 years of age.<br>In the visual quality objective (*VQO) zones* (27% of THLB - rationale, 25), the modification, partial retention and retention VQO's allow 25%, 16% and 5% respectively to be < 30 yrs of age and require 10% to be > 140 yrs of age.<br>In the *Watershed zones* (45% of THLB) a maximum of between 25-33% may be < 31 yrs of age (except for class 6 watersheds for which a maximum of 33% may be < 20 yrs), while a minimum of 10% of the area must be > 140 yrs of age. (analysis, 45) | It is becoming increasingly difficult to find suitable and available timber to meet planning requirements. Both the small business forest enterprise program (SBFEP) and major licensees are expected to fall short of cut control requirements by approx. 15% at the end of the current cut control period (1996). | Role for CT?<br>Harvesting timber using partial harvesting or CT methods has the effect of "relaxing" the constraint. (mid term (MT), long term (LT)) | |
| | *Sensitivity to Changes in Green-up Area and Old-Growth Area - all zones*<br>All zones: Sensitivity tests of ± 5% of area allowed to be not greened up and ± 5% of old forest requirement. (analysis, 27-29)<br>Relax Constraint: (for all zones, allow 5% more area to be not greened-up and require 5% less area to be in older forests ) **Very sensitive.** Harvest levels increase 11% over the base case during the first 6 decades. LTHL 6% higher than base case.<br>Increase Constraint: (for all zones, allow 5% less area to be not greened-up and require 5% more area to be in older forests) **Very sensitive**. IHL 19% below base case, after which harvest levels are 26% lower until the LTHL is reached after 40 years. LTHL 9% below base case. The base case pushed the harvest to the limits of most constraints, so when FCC's are more restrictive a significant change results. **The lower starting level was controlled by the** | | | The short term (ST) harvest level is at serious risk should there be a substantial increase in FCC's.<br>Accelerating growth of young existing stands to achieve earlier green-up would serve to reduce this risk. (ST) |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | **availability of timber in the 3rd decade.**<br>*Sensitivity to Increasing to 4 or 5 Pass Systems - All Wildlife Zones & 3 of 4 Watershed Zones*<br>Sensitivity test of increasing constraints from allowing a max of 33% to be not greened-up (3 pass system) to allowing either 25% (4 pass) or 20% (5 pass).<br>Increase Constraint to 4 pass: IHL 5% below base case and 2nd decade 14% below. LTHL same as base case but reached 1 decade earlier.<br>Increase Constraint to 5 pass: Very sensitive. **IHL 19% below base case** and 23-27% below thereafter until same LTHL reached 2 decades earlier.<br>*Sensitivity to Relaxing Forest Cover Guidelines to Basic Levels*<br>Sensitivity test of relaxing all forest cover guidelines in all zones so that no more than 33% of the area can be < 20 years old (does not change wildlife zone constraint which is already at this level) and at least 10% of the area must be > 140 years old (changes wildlife zone but not others).<br>Increases harvest levels 11% over the base case over the 1st 6 decades. LTHL 6% higher. This is similar to other sensitivity test results. **Forest cover guidelines are relaxed to the point where they are no longer the most binding constraint. The desire for a reasonable rate of decline to the LTHL and for a harvest level that does not fall below the long term level controls the results of this analysis.** | | | |
| | *Sensitivity to Changes in Green-up and Old-growth Ages*<br>*Green-up*: Green-up ages are 20 yrs for all wildlife zones and watershed class 6 zones (ht equivalent is unspecified - 2m? ht) and 30 to 31 yrs for all VQO zones and watershed classes 1-5 zones (6m ht?) (analysis, 45).<br>Sensitivity test of ± 5 years in both green-up and old growth ages, all zones. (analysis, 26)<br>Relaxation of Constraint: (- 5 yrs in both green-up ages and old-growth ages) IHL 11% above base case. Only 1% above base case thereafter, including | Relaxation only affects 1st decade, where harvests rise 11%. Unclear whether effect is a result of changes to g-up ages or old growth ages or both.<br>CF convinced g-up periods have been over-estimated by 1-2 yrs due to overestimate | | Ages used are not likely under-estimated. Not a concern. |

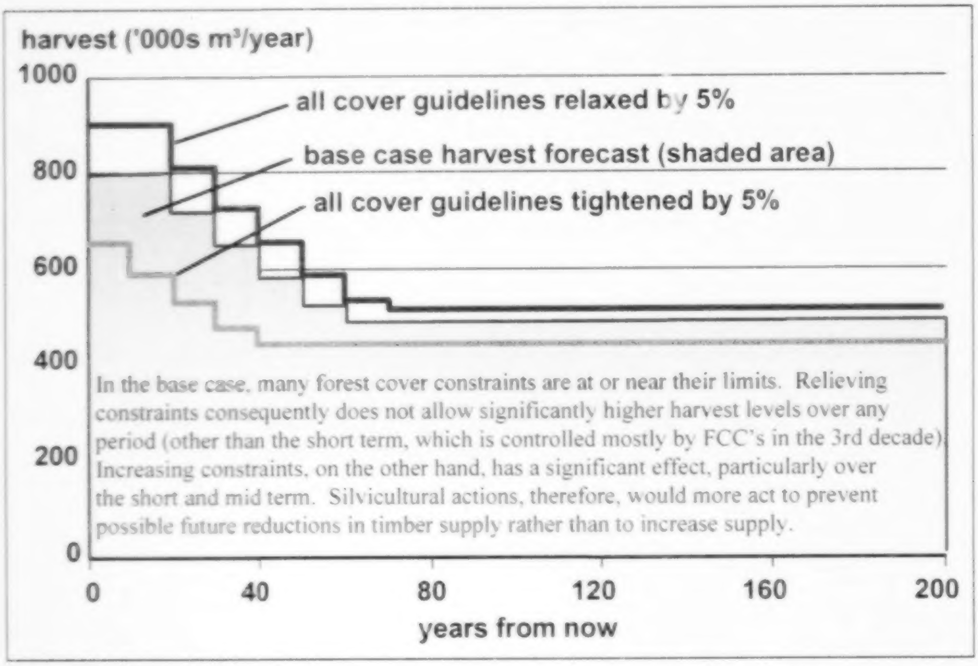
| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | LTHL.<br>Increase Constraint: (+ 5 yrs in both green-up ages and old-growth ages) Moderately sensitive - initial harvest level 2% below base case. 11% below base case thereafter until LTHL is reached, which is 4% below.<br>Sensitivity test of ± 10 years in both green-up and old growth ages, all zones. (analysis, 27-28)<br>Relaxation of Constraint: (- 10 yrs in both green-up ages and old-growth ages) Harvest levels 11% above base case for first 6 decades (**exact same result as for relaxing all forest cover area restrictions by 5%**). LTHL 5% higher.<br>Increase Constraint: (+ 10 yrs in both green-up ages and old-growth ages) **Very sensitive** - initial harvest level 14% below base case. Between 23% & 18% below base case thereafter until LTHL is reached, which is 7% below. | of regen delay but not convinced an 11% increase in IHL can be realized (rationale, 46)<br>When all cover ages are decreased 10 years total growing stock remains almost constant and after about 70 years remains at roughly 17% above base case growing stock levels (analysis, 27-28).<br>**The change in green-up ages also results in green-up area becoming more binding in decade 4**. (analysis, 27) [Are harvest levels drawn down more in decades 2 & 3 to be able to get past decade 4?] | | |
| ◆ Bio-diversity | *Removal of Old-growth Cover Constraint in Watershed and VQ zones*<br>Base case requires at least 10% of stands in these zones must be >140 yrs of age at all times. Sensitivity test of complete removal of this requirement. Older forest requirements for wildlife were not removed. **Very sensitive in 1st decade - IHL is 14% above base case.** After this, harvest levels are 5% higher, including the LTHL. (analysis, 30-31) | See "Age Class" above, "Biodiversity contribution from areas outside the THLB" below. | | Use CT to create old-seral stand structures at earlier ages? Not likely effective by 2nd decade. |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| ◆ Min. Harvest Ages | Minimum ages determined by a committee and do not necessarily reflect biological culmination ages. (analysis, 56) They represent an approximate minimum volume of 150 m3/ha (analysis, 19). Ages are assigned by analysis unit (61 units) and range from 72-126 years. (analysis, 57)<br>Sensitivity test of ± 20 years. Not sensitive to increase or decrease in the long term. (analysis, 21)<br>Decrease: (- 20 yrs) Only sensitive in the first decade, which is 9% above the base case. This is because reducing the minimum age makes more timber available in the short term when the availability of mature timber is particularly critical. **Beyond this decade, forest cover constraints limit the amount of area that can be harvested**. The 9% increase cannot be achieved, however, were the cutblock adjacency rules tightened to a 4 pass system.<br>Increase: (+20 yrs) **Very sensitive**. There is 7% less timber available in each of the 1st 5 decades. LTHL unchanged. | [Check modeling methodology: are ages shifted but vol's held constant; or are both shifted?]<br>Base case use of VDYP presumes no stocking control [check].<br>Raising the min ages reduces the initial available growing stock by 20%. The long term average age is beyond the min ages, resulting in no long term harvest level effect even when min ages are increased 20 years. (analysis, 21)<br>If the forest industry is not capable of using the younger timber that must be harvested during the first few decades of this forecast and the base case, **there could be a shortfall of available timber in the 3rd or 4th decade.** (analysis,21) | There are many references to the timber supply in the 3rd and 4th decades being limiting and dependent upon younger ages (approx 140 yrs old at that time or 110 yrs old now). These stands may be candidates for partial harvesting and fertilization. However, opportunities may be limited because of root rot and fertilization limited because of watershed limitations. (MT) | If younger stands in the 3rd and 4th decade do not prove merchantable at that time, the base case may not be attained. (MT) |
| ◆ Timber Volume Esti-mates | VDYP used for both existing and regenerated stands. (analysis, 22)<br>*Existing stand volumes*:<br>Sensitivity test for ± 10% in volume. **Short term highly sensitive**. Long term insensitive to either increase or decrease. (analysis, 22) | Very sensitive.<br>A recently completed inventory audit indicates no statistical difference between the audit and inventory | There is little silviculture opportunity to raise existing stand vol's in the 1st decade. | Increasing vol's of existing stands would prevent substantial short and mid term |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | Increase: (+10%) **IHL 13% above base case**. Remains 3% above base case until decade 7 when LTHL reached. LTHL unchanged.<br>Decrease: (-10%) **Highly sensitive**. IHL must be decrease by 26% from the base case; 2nd decade is 33% below the base case. The lower volume/ha causes more area to be harvested and thus **the forest cover guideline limits are encountered sooner. This magnifies the timber supply problem in the 3rd and 4th decades** and results in a shortfall in several of the later decades. LTHL reached in 3rd decade, 4 decades sooner than base case. | volume estimates. The mean audit volume was 5 m3/ha > the mean inventory volume. | | reductions if volumes prove over-estimated. However, the most recent information is that volume estimates are accurate. |
| | *Regenerated stand volumes*: VDYP yields used.<br>Sensitivity tests for ± 10% in volume. Short term insensitive to either. Unbalanced sensitivity to both in the long term. (analysis, 22-23)<br>Increase: (+10%) Short and mid term insensitive. LTHL 7% higher than base case, **starting at the beginning of decade 11**. Creates a mid term shortfall during decades 7-10.<br>Decrease: (-10%) **LTHL 14% below base case**. Lower volume/ha means more ha's must be harvested. Forest cover guidelines become more limiting than they are for the base case. | TIPSY yields can be expected to be in the order of 35% higher than VDYP yields at culmination ages. Root rot may reduce these yields by 10-20%, still leaving a 15-25% higher yield. | Possibilities to increase regen vol's: (LT)<br>• Improved seed.<br>• Larger planting stock.<br>• Reduced first operational adjustment factor (OAF).<br>• Fertilization at planting.<br>• Brushing for growth.<br>• Repeat fertilization.<br>• Commercial thin.<br>• Management for root rot to limit losses to 5%. | (LT) |
| ♦ Site Productivity | Armillaria infects an estimated 70% of the land base.<br>CF expects that even if site index of older stands is under-estimated, there would be a small impact overall because only 23% of the THLB is occupied by stands older than 140 yrs. (rationale, 10) | | | |

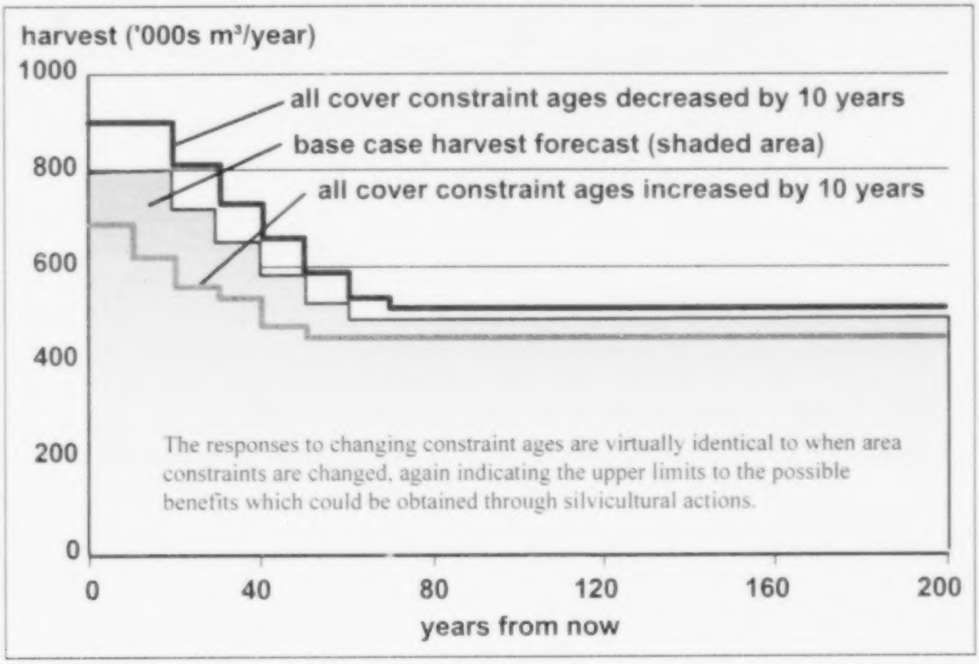
## Illustration of Issues and Silvicultural Opportunities

TSA modelling in support of planning incremental silviculture has not yet been undertaken. In its absence, sensitivity analyses from the TSR analysis report are the best source of information as to the opportunities for incremental silviculture to maintain or increase future timber supply. These opportunities are identified in the "Issues" section, which starts on page 5. The following are selected sensitivity analsysis charts from the TSR2 analysis report, to which opportunity information is added to illustrate the opportunities. Detailed analyses are required to confirm the indicated effects.



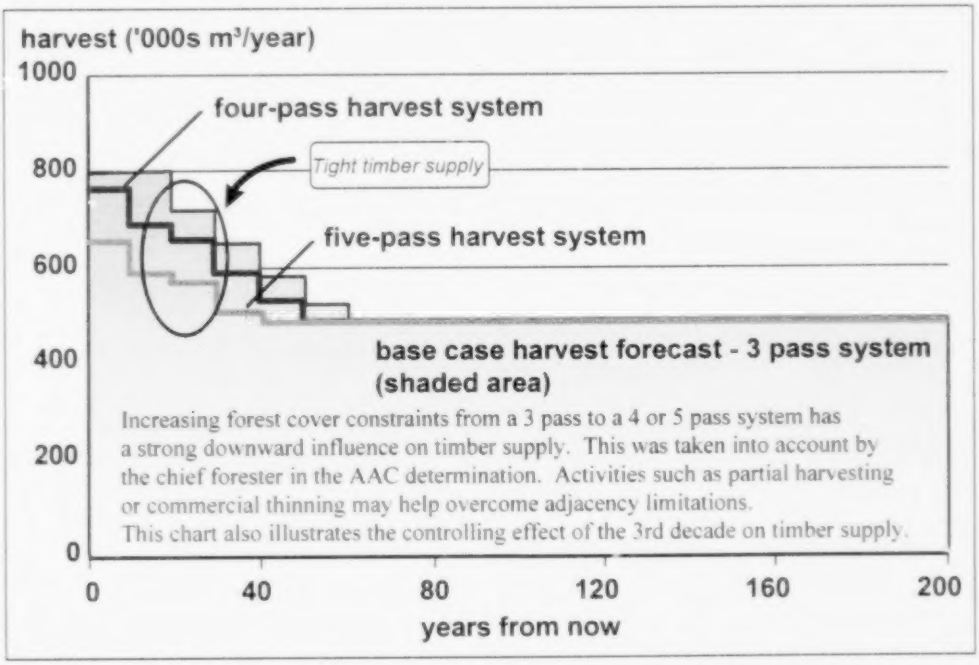
In the base case, many forest cover constraints are at or near their limits. Relieving constraints consequently does not allow significantly higher harvest levels over any period (other than the short term, which is controlled mostly by FCC's in the 3rd decade). Increasing constraints, on the other hand, has a significant effect, particularly over the short and mid term. Silvicultural actions, therefore, would more act to prevent possible future reductions in timber supply rather than to increase supply.

**Figure 1. Changes in adjacency and older forest area requirements, Kootenay Lake TSA**



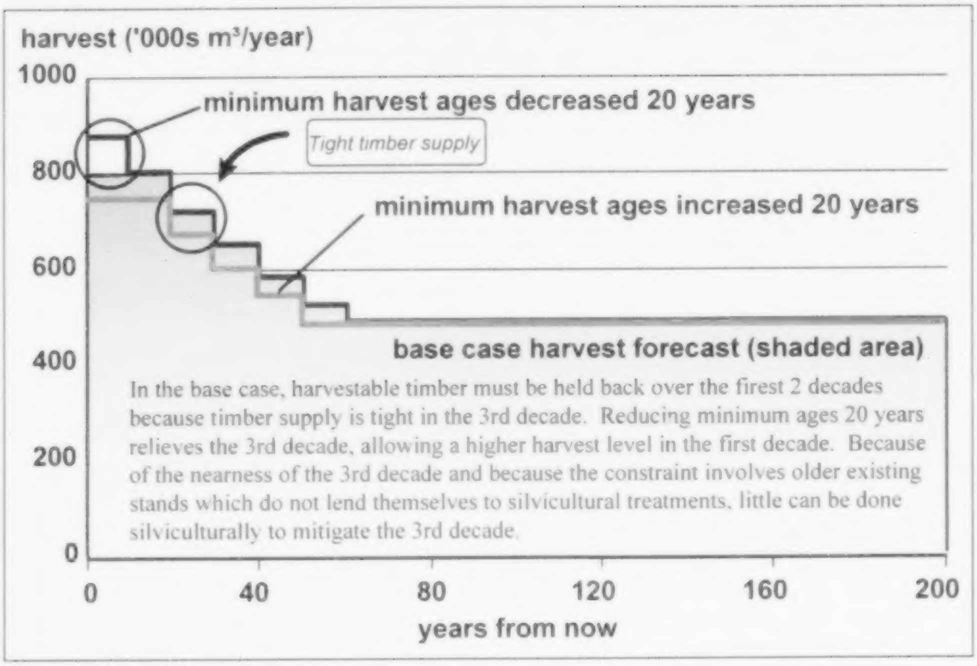
The responses to changing constraint ages are virtually identical to when area constraints are changed, again indicating the upper limits to the possible benefits which could be obtained through silvicultural actions.

Figure 2. Changes in constraint ages, Kootenay Lake TSA



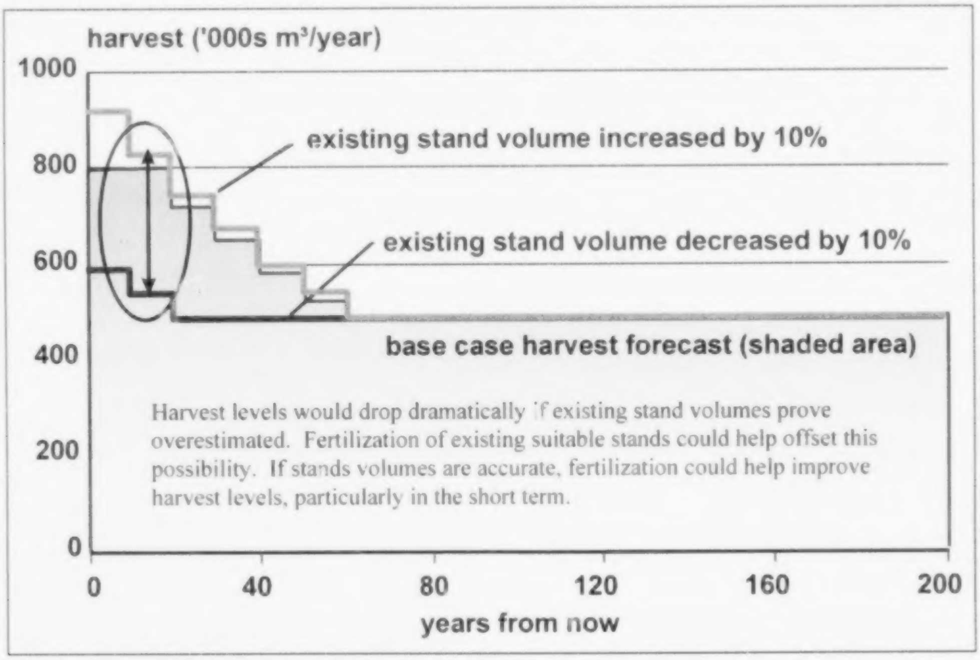
Increasing forest cover constraints from a 3 pass to a 4 or 5 pass system has a strong downward influence on timber supply. This was taken into account by the chief forester in the AAC determination. Activities such as partial harvesting or commercial thinning may help overcome adjacency limitations.
This chart also illustrates the controlling effect of the 3rd decade on timber supply.

Figure 3. Effect of increasing the basic forest cover constraints over all areas, Kootenay Lake TSA



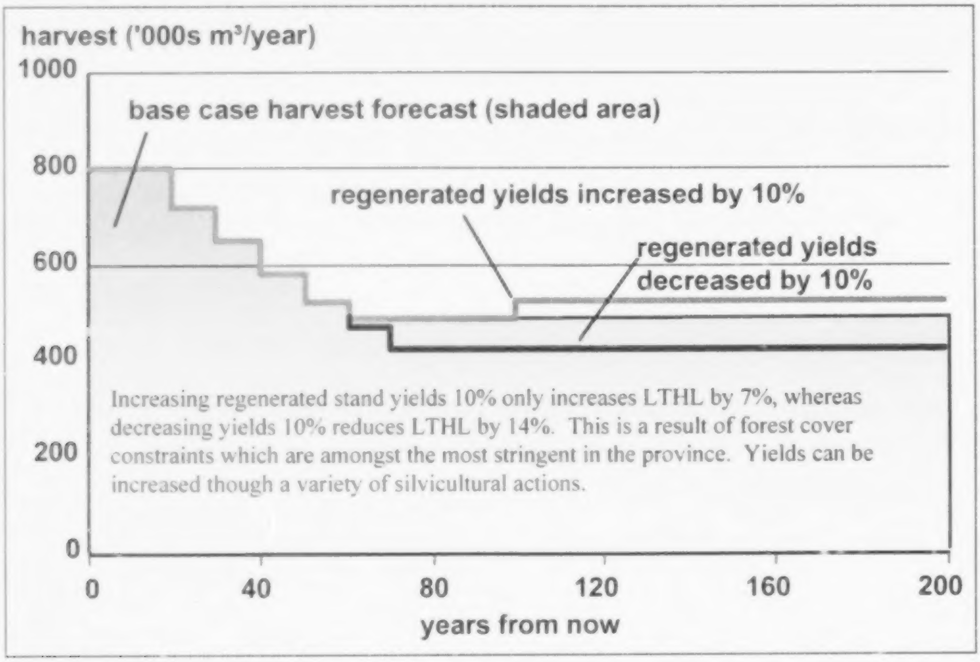
In the base case, harvestable timber must be held back over the firest 2 decades because timber supply is tight in the 3rd decade. Reducing minimum ages 20 years relieves the 3rd decade, allowing a higher harvest level in the first decade. Because of the nearness of the 3rd decade and because the constraint involves older existing stands which do not lend themselves to silvicultural treatments, little can be done silviculturally to mitigate the 3rd decade.

**Figure 4. Changes in minimum harvest ages, Kootenay Lake TSA**



Harvest levels would drop dramatically if existing stand volumes prove overestimated. Fertilization of existing suitable stands could help offset this possibility. If stands volumes are accurate, fertilization could help improve harvest levels, particularly in the short term.

**Figure 5. Changes in existing stand volumes, Kootenay Lake TSA**



Increasing regenerated stand yields 10% only increases LTHL by 7%, whereas decreasing yields 10% reduces LTHL by 14%. This is a result of forest cover constraints which are amongst the most stringent in the province. Yields can be increased though a variety of silvicultural actions.

**Figure 6. Changes in regenerated stand volumes, Kootenay Lake TSA**

## Summary of Issues by Period

### General

The base case harvest forecast is a complex interaction between harvest flow constraints, forest cover constraints and the age class structure. While the base case FCC's are substantial, relaxing them causes some rise in harvest levels across all periods but does not overly increase harvest levels. Sensitivity analysis continually point to harvest flow constraints becoming more binding after FCC's are relaxed. In particular, the 3rd decade is pivotal.

Reactions to positive stimuli appear suppressed. Raising existing stand volumes 10% has a significant impact in the 1st decade, but is marginal after that. Raising regenerated stand volumes 10% raises LTHL only 7%, whereas in 90% of other TSA's the reaction is normally a 10% increase in LTHL.

The most severe impacts and consequent sensitivities are in the 1st and 2nd decade. In many cases little can be done to overcome this in this time period.

Planning incremental silviculture activities is made difficult by the fact VDYP yields were used for regenerated stands. Managed stand yields (using TIPSY) are likely to be noticeably higher, along with lower time until green-up and lower minimum harvest ages.

FCC's are amongst the most limiting of any TSA in the province. As evidence of this, the theoretical LTHL, after allowing for fire and other losses, is about 25% above the base case LTHL. In most other TSA's, the difference is in the 10-15% range. The new methodology used in TSR2, where stands outside of the THLB are considered in the determination of biodiversity and FCC's, may change the limiting factors that so governed this analysis. Conversely, the chief forester noted in the AAC rationale that harvesting on private land has not been taken into account, and that it will impact harvest levels by increasing the amount of area harvested on the total land base, which makes it more difficult to meet overall forest cover requirements (rationale, 28).

The forest cover guidelines result in a large variability in the harvest ages and in the area harvested annually over the first 12 decades. Harvesting normally occurs in the oldest stands first, but the FCC's can cause a shift to harvesting of much younger stands. This occurs when the older timber is in management zones that are at or near the limit of the FCC's. The result is the harvesting of all available timber in all management zones including stands at or near the minimum harvest age. This effect is pronounced during the 3rd decade, when there is a sharp drop in average age of harvested stands (from 300 yrs in decade 1 to 150 yrs in decade 3) and a commensurate sharp rise in area harvested (from 1 750 ha/yr to about 2 550 ha/yr). The forest cover requirements also force postponement of a small amount of the total harvest in the highly restrictive retention VQO area until ages of 400 years or more, which may not prove realistic. (analysis, 17)

### Short Term (1 - 20 years)

Short term harvest levels are reduced to be able to supply enough timber to get through decades 3 & 4 of the mid term, which are severely restricted by FCC's. Thus factors that affect the existing timber supply greatly affect the ability to maintain the initial harvest level for longer or shorter than in the base case.

Increasing minimum harvest ages by 20 years, decreasing existing stand volumes 10%, increasing all cover constraint ages (the green-up age and the minimum age of old-growth), increasing the all cover constraint area requirements by 5%, or allowing only a 5 pass harvesting system in all wildlife and 3 of the 4 watershed zones each can result in a need to lower the IHL substantially below that of the base case (the current AAC).

Decreasing minimum harvest ages 20 years allows the harvest in the first decade to rise above the base case. This is because the need to hold timber until decades 3 & 4 is lessened. These decades are limited by a combination of minimum ages and forest cover constraints, so reducing the minimum ages makes more timber available in this period, in turn lessening the requirement to hold mature timber until then.

The TSR1 base case forecasts harvest levels can be maintained at 803 000 m3/yr for 2 decades. However, the CF determined the AAC at 700 000 m3/yr after taking into account factors which lower the forecast.

### Mid Term (21 - 60 years)

The mid term is characterized by a steady 10%/decade decline in harvest volumes during the transition to the LTHL which is reached at the end of the 5th decade (i.e., at 60 years). For the purposes of this strategy, 60 years is taken as the end of the mid term period.

As noted above under the general comments, the early part of the mid term appears to be the most constraining.

At no time, other than when regenerated stand volumes are increased by 10%, does a sensitivity test result in a mid term shortfall below its forecast LTHL.

The mid term is tightly constrained by both the harvest flow rules and being at or near limits imposed by some forest cover constraints. Relaxing many of the forest cover constraints or increasing existing stand volumes by 10% does not greatly increase harvest levels over this period. The responses to these sensitivity tests are noticeably less than typical responses in other TSA's. This is because the harvest flow rules soon become restricting. Increasing some constraints, on the other hand, particularly those constraints where the existing condition is near or at its limit, can have substantial immediate impacts on both the short and mid term. The effect of tightening the cover guidelines is about double the effect of relaxing them (analysis, 29). The greatest harvest level reduction occurs when existing stand volumes are decreased 10% (while an inventory audit found volumes to be accurate, a reduction in the THLB would likely have a similar effect). The next largest impact occurs when forest cover constraints are tightened.

Decreasing minimum harvest ages has no effect on mid term harvest levels because the harvest flow rules push the harvest level benefit back into the short term. Decreasing minimum ages in decades 3 & 4 will no doubt provide needed flexibility at that time. On-the-ground restrictions are likely to be tighter than a timber supply model would infer.

Increasing regenerated stand volumes 10% extends the mid term period to 110 years, generating a mid term shortfall by raising LTHL above the base case level (but does not lower the mid term below the base case), starting in the 11th decade.

### Long Term (61 + years)

The long term harvest level is insensitive to increasing the forest cover constraints to a 5 pass system in the four wildlife zones (from 3 pass system in the base case) and in all four watershed zones (from 3 and 4 pass systems in the base case). However, LTHL is significantly affected (9% below base case) by tightening all forest cover area guidelines by 5%. Unfortunately, this sensitivity analyses at the same time both decreased the area allowed below green-up and increased the area required to be in mature forest making pinpointing sensitivity difficult. Between the two sensitivity analyses, it can be concluded that the long term is sensitive to either reducing the area allowed below green-up in the VQO zones or to increasing the old-growth requirements. VQO's cover 27% of the THLB and have the most restrictive cover requirements of all zones. Increasing the requirement by 5% is a higher % increase than for the other zones (For example, the retention VQO allows only 5% of the area to be not greened up in the base case. Reducing this 5% eliminates all harvesting from this zone). This, then, is more likely to be the cause than increasing old-growth requirements. The harvest forecast is not sensitive to reduction in the area allowed below green-up in the wildlife or watershed zones.

As age classes even out, the long term becomes more affected by forest cover constraints. The "fit" is so tight that increases or decreases in regenerated stand yields show substantially disproportionate response. A 10% increase in yields results in only a 7% gain in harvest levels over the base case. This lower than normal response may be attributed to the fact that timber is often held considerably beyond its biological culmination age, resulting in lower average annual rates of growth than if harvested at or near culmination. [check]. When regenerated stand volumes are lowered 10% the lower volume/ha means more area must be harvested to obtain to obtain the same harvest level. However, with more area being harvested, forest cover guidelines become more limiting than they are for the base case.

When regenerated stand volumes are increased 10%, LTHL does not rise until 100 years from now, indicating this is when the first of the regenerated stands become available.

### Future

There were a number of unknowns at the time of the TSR1 analysis, including site productivity, impact of the Forest Practices Code, the outcome of the protected areas strategy, and the volume gains associated with managed stands. Many of these unknowns will be clarified for TSR2. The TSR2 base case may have a different profile than TSR1. This needs to be taken into account when designing an incremental silviculture strategy. Adopted strategies should be robust and made in the anticipation that they will still be valid following re-analysis.

## Incremental Silviculture History

Approximately 2000 ha are harvested annually.

| Treatment | TSR1 Status (1993) | | Current Status (1998) |
|---|---|---|---|
| | Incorporated in Timber Supply Analysis | Not Incorporated in Timber Supply Analysis | Source: KLFD[2] |
| ◆Backlog | Objective is to rehab 5 313 ha by year 2000. Analysis assumed 6 133 ha will be restocked over the next 20 yrs. | | Approx 1 800 of 3 600 ha of backlog are economical to treat. 5 500 ha of existing plantations require maintenance. Current program is to plant 300 ha/yr and brush 1 200 ha/yr. |
| ◆Conversion | | | |
| ◆Commercial Thin | | | |
| ◆Space | | | 200 ha/yr. |
| ◆Prune | | | 60 ha/yr. |
| ◆Fertilize | | | 500 ha every 5 years. |

## Higher Level Goals and Objectives

This section documents higher level goals and objectives relevant to an incremental silviculture strategy for the TSA.

### Provincial Goals

Fundamentally, government's goals can be characterized as:

- sustainable use;
- community stability; and
- a strong forest sector. (MoF, 1998a)

### Provincial Objectives

Until provincial targets for timber quantity and quality are established, management unit strategies are to consider the following interim provincial strategic objectives (MoF, 1998a). Incremental silviculture strategies must also be in keeping with higher level plans under the Forest Practices Code.

**Objective 1:** Maintain current harvest levels as long as possible without creating disruptive shortfalls in future timber supply.

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[2] KLFD - Kootenay Lake Forest District

**Objective 2:** Create a long term timber supply capable of supporting a steady long term provincial harvest level similar to current levels.

**Objective 3:** Minimize the interim shortfall in provincial harvest anticipated before a steady long term timber supply is achieved.

**Objective 4:** Create a long term timber supply which will enable the timber quality profile of future harvests to be the same or better than the current profile.

The Provincial goal is to bring all backlog sites to free growing status by the year 2015.

It is recognized that not every management unit has the same capability to contribute to these interim objectives. Further, it is recognized that these objectives may not be attainable at current funding levels. Their purpose is to provide general guidance to the application of available funds.

## Regional Objectives

The region has not set out formal regional incremental silviculture objectives. In the interim, the provincial objectives are accepted as being broadly applicable within the region.

## Higher Level Plans

Formal higher level plans are strategic plans defined by the Forest Practices Code, however, there are currently no approved higher level plans covering the Kootenay Lake Forest District. The Kootenay Boundary Land Use Plan has been approved but the decision whether to make it a higher level plan has not been finalized. Until that time it provides guidance for management practices.

There are other plans that exist at a higher level which are strategic (policies and guidelines), or operational that provide direction to any lower level of plans, prescriptions, or forest practices. These, however, are not higher level plans as defined under the Code.

## Local Resource Use Plans

Local resource use plans are not higher level plans as defined by the Forest Practices Code, but are respected when preparing prescriptions. Examples of local resource use plans are:

Arrow Mountain
Smallwood Creek
Kaslo River
Duck Creek
Summit Creek
Twin Bays
Powder Clute
Yahk CRMP
Clearwater Creek
Blewett
Anchor Creek
West Arm Demonstration Forest
Ainsworth
Queen's Bay
Pilot Peninsula
Sitkum

## Opportunities to Increase Timber Supply

### Potential Silviculture Strategies

Prior to the district workshop, information in the previous sections was used to identify the following silvicultural strategies as having potential to either maintain or increase future timber supply at the TSA level.[3] Each of these was reviewed in the workshop, to the extent time allowed. The results are recorded in "Workshop Review of Potential Strategies," page 23, along with additional strategies that arose during the meeting. Strategies that are ultimately adopted are noted in "Silviculture Strategies," page 40.

- **Short Term (1 - 20 yrs)**

ST 1: Fertilize all suitable stands scheduled for harvest in the 2nd decade. (increase)[4]

ST 2: Overcome adjacency limitations by implementing partial harvesting/CT regimes in all zones, particularly the VQO zone. (increase)

- **Mid Term (21 - 60 yrs)**

MT 1: Continue partial harvesting/CT regimes as in ST 2. (increase?)

MT 2: Repeat fertilize all suitable existing stands scheduled for harvest 20 to 100 years from now to increase harvested volumes. (increase)

MT 3: Commercially thin stands to create old-seral attributes earlier. (increase)

- **Long Term (61+ yrs)**

LT 1: (a) Rehabilitate all remaining treatable backlog NSR and (b) brush ___ ha of existing backlog plantations. (maintain)[5]

LT 2: Increase the THLB by:

a) rehabilitating NCBr; (increase)

b) converting/rehabilitating deciduous stands; (increase)

c) converting/rehabilitating non-merchantable hemlock stands; (increase)

d) improve the site productivity of low-site stands by (fertilization?). (increase/maintain)

LT 3: Reduce losses to root rot by ___________ (increase).

LT 4: Increase the volumes of regenerated stands 20%.

### Available Information Regarding Potential Treatments and Treatable Area

This section summarizes available information directly relevant to the potential treatments for the TSA.

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[3] The original draft presented in the workshop contained gaps in strategy numbering. These have been eliminated in this document.

[4] (increase) means oriented to increasing harvest levels above those indicated by the TSR2 base case.

[5] (maintain) means oriented to maintaining the harvest level indicated by the TSR 2 base case.

Draft

| Treatment | Comment | Treatable Area |
|---|---|---|
| ◆ Brushing | On many sites, herbaceous brushing is critical to seedling survival, and is an important component of regenerating a site. Spot treatment around individual seedlings, is preferable to brushing entire sites. Where public concerns allow, herbicide spot treatments should be utilized, as this form of treatment has proven to be the most effective, and least expensive method of controlling competing vegetation.<br>Deciduous brushing ensures that the growth of the conifers is not impeded and that free growing is achieved. Uninterrupted height growth is critical to achieving height and crown size objectives. In recognition of the value of deciduous species for biodiversity, some deciduous trees should be retained, either singularly or in groups. Brushing prescriptions should consider the ecological value of deciduous species, such as alder, *Sheperdia* and *Ceonothus* for nitrogen fixation, and birch and aspen for reducing the spread of *Armillaria* root disease. | |
| ◆ Spacing | Juvenile spacing is a pre-requisite to fertilization, pruning, or commercial thinning activities.<br>Spacing is used primarily to increase individual tree diameters by concentrating the growth potential of a site on fewer stems. At lower densities larger piece size is produced at the expense of total yield. Species composition can also be controlled and shifted to faster growing species if desired. Removal of competing deciduous and other conifers is also done at this stage. Height growth, which is a function of site index and not density, is not usually affected unless there is height repression impacting over dense stands (e.g. Pli stands > 40,000 sph). Merchantable volume can increase, total volume may decrease, and there is a reduction in the time needed to get a particular diameter. This has the effect of producing merchantable trees sooner, thereby decreasing the harvest age and making more wood available sooner.<br>The value of treated stands will be increased as well. This could be equally important as increased volume. Stand values are increased by lower harvesting costs due to fewer pieces, better prices for larger logs and potentially increased merchantable volume.<br>Studies have shown that for some management units, it may be possible to directly increase mid-term timber harvests by intensively managing those stands scheduled for harvest in that period. It is also likely to increase mid term harvests by shifting harvest volume from the long-term to the mid-term through commercial thinning opportunities that would not exist without early density control. This strategy is generally adopted in management units where age class imbalances create timber supply shortages in the mid-term. This is not the situation in the Kootenay Lake TSA, where a well balanced age class distribution occurs. Future timber supplies are not restricted by lack of suitable wood, but rather by very high levels of constraint to meet other resource objectives (ie. water, and visuals).<br>Stand-level prescriptions must ensure that landscape level objectives are achieved. This treatment has the potential to negatively impact the visual quality and hydrologic recovery of an area, because | |

| Treatment | Comment | Treatable Area |
|---|---|---|
| | spacing reduces crown closure. Post treatment densities should generally be maintained at or above Regional guideline targets in all watershed areas.<br>Currently, juvenile spacing is considered a low priority.<br>However, CF recognizes may have a role in reducing greenup ages and alleviating anticipated adjacency problems in the 3rd and 4th decades when combined with fertilization. | |
| ♦ Fertilization | Fertilization is the application of nutrients, primarily nitrogen, in order to increase the growth rate of the tree, particularly in height, diameter and crown width. Of all the treatments that have the potential to quicken green-up, fertilization and the planting of genetically improved seedlings show the most promise. Fertilizing suitable stands will also reduce rotation ages, increase merchantable volume of harvested stands, and increase the value of pruned stands.<br>The following stand conditions must be present to realize the financial and volume gains anticipated:<br>• Fertilize only spaced stands to ensure additional growth is captured only on dominant trees that will survive until harvest<br>• Fertilize spaced stands approximately 10-15 years prior to commercial thinning to maximize thinning yields<br>• Fertilize commercially thinned stands 10-15 years prior to final harvest to maximize growth on the residual trees<br>• Fertilize spaced and pruned stands to maximize the amount of clear, mature wood.<br>Fertilizing older stands may have some potential to improve merchantable yields, but there are few natural stands that have both suitable biological characteristics and a reasonable chance of being harvested on schedule to capture the effects of the fertilizing. Therefore fertilizing older stands is not a recommended strategy at this time.<br>Although technical studies indicate water quality is unaffected by careful fertilizer application most watershed groups oppose the use of "chemicals" in domestic watersheds. For the present, fertilizing stands in licenced watersheds should be avoided. | Candidate stands limited by type and location. |
| ♦ Commercial Thinning | The demand for fibre from commercial thinning in the future is not possible to predict, however, the recent trends of decreasing utilization standards suggest that the demand may continue. Additionally, there is a greater and continuing demand for partial cutting to meet more of the non-timber management objectives such as visual quality, biodiversity etc. If these demands for increased partial cutting continue, and appropriate stand densities have not been planned, there will be few options to meet the demand other than at the expense of future harvests.<br>The effects of this treatment are more indirect than previously discussed treatments as commercial thinning allows some merchantable volume to be realized in areas where non-greened up areas are at a maximum. Due to the similarity to partial cutting, | Approx. 73 000 ha ages 41-80. Opportunities are limited by root rot, wildlife needs for thermal cover, and the lack of suitable stand structure in unmanaged natural stands. |

| Treatment | Comment | Treatable Area |
|---|---|---|
| | this treatment leaves most of the remaining stand intact, thereby minimizing additions to the non-greened up area. Stands most suitable for commercial thinning are juvenile spaced stands. In the past this treatment has not been widely prescribed due to the relative abundance of large sawlogs and poor markets for small sawlogs and pulpwood. In the future as available wood supplies decrease, it is possible that the markets for this type of material will improve, making this a viable treatment. | |
| ◆ Conversion | THLB could be increased by over 5% were deciduous and non-merchantable areas rehabilitated. | 11 500 ha deciduous types<br>3 000 ha classified non-merchantable |
| ◆ Backlog NSR | Planned for restocking in 20 years (TSR1). No additional opportunity. | |

## Workshop Review of Potential Strategies

Explanatory notes with respect to the following tables.

| Column Number | Note |
|---|---|
| 1 | The response time frame is the period in which the anticipated result is expected, not the period in which actions must necessarily commence. |
| 2 | Strategy numbers correspond with the numbers recorded earlier in "Potential Silviculture Strategies," page 20. Items followed by an asterisk (*) were added during the district workshop. |
| 3 | Information is largely from a meeting of ministry personnel and forest licensees held November 23 & 24, 1998 in Nelson (the "district workshop") combined with information presented earlier in this document. |
| 4 | Anticipated results are typically calculated using the timber supply response indicated by TSR1 sensitivity analyses. |
| 5 | The TSR1 base case is adjusted to roughly account for major changes since it was produced. The harvest forecast column was not thoroughly reviewed during the district workshop. *Results are largely conjecture and are meant to illustrate the potential of the strategies.* |

<table>
<tr><th>Response Time Frame</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th><th>Harv Forecast (000s m3/yr)</th></tr>
<tr><td></td><td>Base Case Adjustment</td><td>(a) The chief forester, in the TSR1 AAC determination, found the base case to over-estimate short term harvest levels and therefore set the AAC at 700 000 m3/yr, approx. 100 000 m3/yr below the base case IHL, and 200 000 below the pre-TSR AAC. The new AAC becomes the starting point for any future harvest level projection.<br>(b) The TSR1 base case is now 5 yrs old and it used data that was probably already 5 years old. Developing an appropriate incremental silviculture strategy necessitates broadly adjusting the base case, particularly to determine if the shape of the harvest forecast has changed since then. (Different shapes often merit different strategies.) Major adjustments were estimated in the workshop as follows.
<table>
<tr><th>Factor</th><th>Short Term</th><th>Long Term</th></tr>
<tr><td>Protected areas</td><td>-10%</td><td>-10%</td></tr>
<tr><td>Change from VDYP to TIPSY</td><td>0%</td><td>+25%</td></tr>
<tr><td>Old growth site index adjustment</td><td>0%</td><td>+10%</td></tr>
<tr><td>Watershed/fisheries</td><td>0%</td><td>-10%</td></tr>
<tr><td>Total</td><td>-10%</td><td>+15%</td></tr>
</table>
13% of volume and 8% of area will be removed from the TSA due to new protected areas (Lasca, White, Grizzly creeks). The workshop estimate of a related short term 10% reduction is probably low. There was not TSR1 land base sensitivity test. The best indication is a sensitivity test of a 10% reduction in existing stand volumes. This showed a dramatic 26% reduction in the base case IHL.<br>There is some uncertainty whether the positive effect of TIPSY yields has adequately accounted for root rot losses.<br>Avg site index is 2m/ha/yr. This seems low given the TSA is mostly interior cedar-hemlock (ICH) zone. Anticipate a doubling for age class 8 & 9 stands, which are 22% of the THLB.<br>Watersheds are 41% of THLB. On non-watershed lands, other important IRM issues exist (Kootenay-Boundary Land Use Plan (KBLUP)).</td><td>In total, short term harvest levels can be expected to be slightly below TSR1 while long term levels may be higher. The transition from short to long term becomes less dramatic but basically the shape of the harvest forecast can be expected to be similar to the TSR1 base case.</td><td>Initial harvest level<br>700 AAC<br>-70 10% adj<br>630<br>Long term harvest level<br>490 LTHL<br>+74 15% adj<br>564</td></tr>
</table>

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Harv Forecast (000s m3/yr) |
|---|---|---|---|---|
| ◆ Short Term (1 - 20 yrs) | 1. Fertilize all suitable stands scheduled for harvest in the 2nd decade. (increase) | 1. Many stands coming up for harvest are too old for fertilization. They would have to be CT'd first to open up the canopy to provide room for it to expand in response to fertilization. However, in the Kootenay Lake TSA the oldest stands are not necessarily being harvested first, due to cover constraints. Thrifty stands that may be eligible for harvest in the 2nd decade are very scattered and do not lend themselves to an operational fertilization program. **A very small program of 100 ha/yr could be considered** if there was certainty that the fertilized stands could be harvested at an appropriate time in the future to capture the effects of the fertilization. | 1. 100ha/yr of fert = (100 / 2 000 ha/yr of harvest =) 5% of annual area harvested. A 5% vol gain would result in a (.05 X .05 X 100 =) 0.25% increase in 2nd decade harvest levels.<br>Minimal effect at the management unit level. Consider for stand level effects. | Short Term Summary<br>630 1st dec.<br>-60 10%/dec decline<br>570 2nd dec<br>570 2nd dec.<br>1 fert (0.25%)<br>0 CT & Fert & earlier grn-up<br>571 total |
| ◆ | 2. Overcome adjacency limitations through (a) reducing green-up delay* and (b) regimes of spacing and commercial thinning in all zones, (c) particularly the VQO zone. (increase).[6] | 2. Determined to mostly have a mid term effect. See MT 1 below. | 2. No short term effect. See MT 1. | |

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[6] * - indicates added during the district working session.

<table>
<tr><th>Response Time Frame</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th><th>Harv Forecast (000s m3/yr)</th></tr>
<tr><td>◆ Mid Term (21 - 60 yrs)</td><td>1. Overcome adjacency limitations through:<br>(a) reducing time to green-up;*</td><td>1. (a) Time to green-up can be substantially reduced from TSR1 levels.
<table>
<tr><th></th><th colspan="3">Age to reach ht</th></tr>
<tr><th></th><th>2m</th><th>3m</th><th>9m</th></tr>
<tr><td>TSR1</td><td>22</td><td>26</td><td>48</td></tr>
<tr><td>Actual current (Reichenback)</td><td>14</td><td>16</td><td>40</td></tr>
<tr><td>w genetic improvement</td><td>11</td><td>13</td><td>25#</td></tr>
<tr><td>w genetic + large stock</td><td>10</td><td>12</td><td></td></tr>
</table>
# Workshop participants felt the time to reach 9m with improved stock would be considerably shorter than at present. A 25 yr estimate is derived (post workshop) as follows. At ½ m ht growth/yr, should grow from 3m to 9m in 12 yrs. Should reach 9m at 13 + 12 = 25 yrs. This is half the TSR1 estimate, and is consistent with the 2m and 3m estimates also being half.<br>2nd generation improved stock is not available until 2015 (see 4a), so related green-up benefits cannot occur until then.</td><td>1. (a) TSR sensitivity analysis (fig 20) indicates a 10 yr reduction in both green-up ages and older forest requirements results in an 11% increase in harvest levels during the 1st 6 decades (LTHL increased 5%). Effect of reduced green-up ages alone is not modeled. Timberline study (p36) indicates a 6% rise in harvest levels in decades 3-6 when green-up ages are reduced 5 yrs. See "Summary" below.</td><td>Mid Term Summary<br>564 - LTHL reached in decade 3<br>34 CT & Fert & earlier grn-up (6%)<br>1 Fert prior to hrvst<br>599 Total</td></tr>
<tr><td>◆</td><td>(b) regimes of spacing and commercial thinning in all zones,</td><td>(b) Hawe (1996) found "...in the Kootenay Lake District, it is likely that there is significant potential for increasing the amount of partial cutting used." Timberline (1997) undertook sensitivity analysis and tree and stand simulator (TASS)-based responses to stand-alone treatments of commercial thinning and fertilization, as well as combinations of the two. They also looked at the effect of fertilization on green-up. Although the reasons for some of the responses were unclear and some of the responses do not correspond to the findings of TSR1 sensitivity analysis, Timberline generally indicates commercial thinning can yield improvements in harvest levels in 3 to 5 decades from now. CT was modeled over all decades, so no indication is provided as to when CT should optimally begin and end to achieve this benefit.<br>An analysis by Wang and Pollack (1998) on the effects of partial cutting/CT in the Arrow TSA supports the Timberline findings. This study demonstrates increased harvest levels can be obtained from concentrating partial cutting/CT activities in constrained areas.</td><td>(b) Timberline indicates a 5% gain in decades 3 & 4 and a 2% gain in decade 5 from CT & fertilizing 300 ha/yr (p39). See "Summary" below.</td><td></td></tr>
</table>

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Harv Forecast (000s m3/yr) |
|---|---|---|---|---|
| | | Root rot can limit CT options. Studies using the Prognosis model have indicated the best partial harvesting strategies (Pollack and Robinson, 1996). Further study of root rot management techniques and options are needed. Noted under "Summary of Information and Research Needs," page 42.<br>Because of past fire suppression history, programs of commercial thinning from below would also serve to maintain ecosystem processes, similar to what government agencies are trying to accomplish in the Columbia River Basin project, south of the US border. | | |
| ♦ | (c) particularly the VQO zones. (increase). | (c)(Not reviewed in the workshop.) VQO zone is 27% of THLB. Typically this zone is very limiting to timber supply, due to the low area allowed below green-up as well as having a higher green-up ht (6 m vs. 3 m in general zones). TSR1 did not undertake a separate sensitivity analysis, so no info is available. Info from other TSA's would suggest focusing CT in visually sensitive areas would have the greatest benefit. Watershed zones (45% of THLB) are similarly limiting in 6m ht, but the area allowed to be not greened up is not as limiting. | (c) No information available. | |
| ♦ | 1. Summary | 1. Summary<br>**Further analysis is required**. The KBLUP constraint reports can be used to help pinpoint what constraints are binding timber supply and their location; i.e., in what landscape units and habitat types. **Treatable timber types must be identified now** and spaced (if not already spaced) and perhaps fertilized to set up for commercial thinning in 30 to 50 years. Candidate stands would probably be currently aged 10 -25 years old (unspaced) and 25-40 years old (previously spaced to densities suitable to CT), on M or G site, accessible, relatively free of root disease, and within visually sensitive or watershed areas. The extent of CT may be limited by the Equivalent Clearcut Area (ECA) rule. **Assume in the interim a spacing program of 200 ha/yr to set up stands for CT** (assumes the equivalent of 100 ha/yr has already been spaced). Assume 20% (see L4g) of 300 ha/yr planned for CT is suitable for fertilization, **equals 60 ha/yr of fert**. CT & post-CT fert would occur 30 to 50 years from now. | 1. Summary<br>Because the TSA is heavily constricted it is unlikely the benefits from both earlier green-up and the use of CT are additive. Also, CT may not be able to be implemented to the level that was modeled. ⇒ Assume no gain in the short term, and a 6% gain overall in decades 3-6.<br>**Further analysis is required**. | |
| ♦ | 2. Repeat fertilize all suitable existing stands scheduled | 2. Effectively, this strategy is a continuation of ST 1. See ST1. | 2. Minimal effect at the management unit level | |

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Harv Forecast (000s m3/yr) |
|---|---|---|---|---|
| | for harvest 20 to 100 years from now to increase harvested volumes. | | (0.25% increase). Consider for stand level effects. | |
| ◆ | 3. Commercially thin stands to create old-seral attributes earlier. (increase) | 3. Half of land base has old-growth constraints. In the analysis, age is a surrogate for biodiversity and stand structure. Silviculture treatments may be used to create suitable stand structures or create old growth recruitment areas. There is a lack of knowledge about these structures and attributes. More refined definitions are needed before strategies can be developed. Noted under "Summary of Information and Research Needs," page 42. | 3. More information required. | |
| ◆ Long Term (61+ yrs) | 1. (a)Rehabilitate all remaining treatable backlog NSR - 1 800 ha (maintain); and<br>(b) maintain 5 000 ha of existing backlog plantations. (maintain) | 1. Backlog rehab is a top priority in order to reduce the area considered not greened up. May have positive impacts over all time periods.<br>(a) Gross backlog NSR area is now about 3 600 ha, of which 1 800 is operable. **A program of 1 800 ha over the next 5 years is needed**.<br>(b) About 5 000 ha of previously restocked backlog areas require maintenance. Brushing is needed on some plantations to ensure they attain free-growing. **A program of 1 000 ha/yr over the next 5 years followed by 750 ha/yr for 5 years is needed**. [Requires confirmation.] | 1. (a) (b) Maintain base case LTHL. | Long Term Summary<br>564 - LTHL reached in decade 3<br>0 rehab & maintain backlog<br>23 incr THLB (4%)<br>0 root rot<br>56 rgn stnd vols (10%)<br>643 Total |
| ◆ | 2. Increase the THLB by:<br>(a) rehabilitating non-commercial brush (NCBr); (increase) | 2. Type / Area / %THLB<br>NCBr / 4 600 / 1.5<br>Deciduous / 11 500 / 4.0<br>Low volume / 3 000 / 1.5<br>Low site / 32 500 / 11.0 | 2. Summary<br>Assume, in total, THLB could be increased by 10 000 ha. or 4%. No TSR1 sensitivity analysis for land base changes. | |

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Harv Forecast (000s m3/yr) |
|---|---|---|---|---|
| | | Bringing these areas into the THLB may impact green-up. Generally, not much volume can be obtained from these stands, but when in a non-greened up state they contribute equally as does an area that had a high-volume stand. There is also concern about the impacts on other resources, particularly wildlife. Work done in Cranbrook TSA indicates that for every 3 ha brought into the land base only 1 ha can be logged on due to constraints. | Analysis in other TSAs generally indicates a 4 % increase in land base raises LTHL by 4%. Assume LTHL impact only. | |
| | | (a) NCBr has wildlife habitat potential. Few large contiguous areas that lend themselves to treatment. More info needed. | | |
| | (b)converting /rehabilitating deciduous stands; (increase) | (b) Decid is mostly aspen/cottonwood in lower areas. A significant portion of the cottonwood may be in riparian reserves. About 5 000 ha of aspen. Again, can have impacts on wildlife and on green-up. Rather than total rehab probably better to underplant and hack and squirt the aspen. **A survey in year 1 is required to determine the overall opportunities.** (Noted under "Summary of Information and Research Needs," page 42.) **Possibly start with a small program of 100 ha/yr. Need a different yield curve** to properly assess the contributions of such stands to future harvests. (Noted under "Summary of Information and Research Needs," page 42.) | | |
| ◆ | (c) converting/rehabilitating non-merchantable hemlock stands; (increase) | (c) Not specifically discussed in the workshop. | | |

<table>
<tr><th>Response Time Frame</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th><th>Harv Forecast (000s m3/yr)</th></tr>
<tr><td>♦</td><td>(d) improve the site productivity of low-site stands by (fertilization?). (increase/maintain)</td><td>(d) This is the most significant area reduction. Work on problem forest types (PFT's) in the Cranbrook TSA identified 3 000 000 m3 of additional volume from low site stands which has been previously netted out. <b>Need to do a similar inventory in Kootenay Lake at an estimated cost of $140 000.</b> Need to determine how many sites are actually low site and how many are mis-classified. (Noted under "Summary of Information and Research Needs," page 42.) Although some low-site stands may be mis-classified as higher site, there is generally a bias to classifying higher site as low site, so expect to see a net gain. Once the characteristics of true low site stands are determined, it may be possible to derive a silviculture strategy to bring some of them into the THLB. In the meantime, fertilization of low site is not a viable strategy.</td><td></td><td></td></tr>
<tr><td>♦</td><td>3. Reduce losses to root rot through various management practices (maintain).</td><td>3. TIPSY OAF2 of 5% will be used in TSR 2. Expectation is that this does not adequately reflect current losses to root rot. The need for further study of root rot management noted under "Summary of Information and Research Needs," page 42.<br>Estimate of extent of root rot:
<table>
<tr><th>Zone</th><th>%THLB</th><th>% Incidence</th><th>%stand vol loss</th><th>% mgmt unit vol loss</th></tr>
<tr><td>ICH</td><td>50</td><td>100</td><td>25</td><td>13.0</td></tr>
<tr><td>ESSF</td><td>40</td><td>10</td><td>10</td><td>0.4</td></tr>
<tr><td>MS</td><td>10</td><td>10</td><td>10</td><td>0.1</td></tr>
<tr><td></td><td></td><td></td><td>Total:</td><td>≅ 14</td></tr>
</table>
<table>
<tr><th>Alternative management options</th><th>potential/yr (ha)</th></tr>
<tr><td>• stumping</td><td>125</td></tr>
<tr><td>• alternate species</td><td>125</td></tr>
<tr><td>• include deciduous</td><td></td></tr>
<tr><td>• <b>pop-up spacing</b></td><td><b>100</b></td></tr>
</table></td><td>3. Neutral. Actual increases in long term volume availability as a result of these practices is not known at this time. Assume will reduce losses to 5% as planned for use in TSR2 base case.</td><td></td></tr>
</table>

<table>
<tr><th>Response Time Frame</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th><th>Harv Forecast (000s m3/yr)</th></tr>
<tr><td>◆</td><td>4. Increase the volume of regenerated stands 20% by:<br>a) using improved seed; (increase)</td><td>4. (a) 90% of areas are planted. About 75% of S (which is 50% of planting) is improved; not available for high elevation sites. All Pl is improved. Improved larch will be available in 3-5 yrs, with 2nd gen in about 35 years. No improved Fdi. Latest estimates of yield gains are (%):[7]
<table>
<tr><th>Species</th><th>Cur %</th><th>Future %#</th><th>1st gen % gain</th><th>2nd gen % gain</th></tr>
<tr><td>S</td><td>25</td><td>40</td><td>2-3</td><td>20 by 2015</td></tr>
<tr><td>Pl</td><td>20</td><td>30</td><td>2-3</td><td>20 by 2015</td></tr>
<tr><td>Fd/Lw</td><td>40</td><td>20</td><td></td><td></td></tr>
<tr><td>Cw/Hw</td><td>15</td><td>10</td><td></td><td></td></tr>
</table>
# Estimates were not completed in the workshop. Confirmation of trends between current and future profile required.<br>Yield gains were not included in TSR 1.</td><td>4. a) Sensitivity analysis indicates LTHL rises 7% with a 10% increase in regen stand volumes. Based on S & Pl 2nd gen gain, LTHL can be expected to rise (70% of area X 20% gain X.7 =) 10%.</td><td></td></tr>
<tr><td>◆</td><td>b) managing stocking so voids do not account for more than 10% of the area; (increase)</td><td>(b) (Not reviewed in workshop - insufficient time.) TIPSY standard OAF1 factor for voids is 15%. Objective is to reduce this to 10%. Current free growing requirements will result in < 15% in voids, however the actual amount is unknown. There is a need for completion of surveys for voids to get a measure of the actual area in voids (noted under "Summary of Information and Research Needs," page 42). Voids can be desirable for wildlife habitat, so intensive void management may not be practicable on all areas. See also 4 (h) below.</td><td>b) Not reviewed.</td><td></td></tr>
<tr><td>◆</td><td>c) using larger planting stock; (increase)</td><td>(c) Pre free-growing item. Larger stock could be used but not likely in current economic conditions. Common stock types are 1+0, 415 for S, Fd & L -, except 412 used for higher elevation S; and 1+0, 410 for Pl.<br>Moving up to a 1+0, 512 stock costs about $.30/tree. Doing this on all planted areas would cost (90% of area planted X 2 000 ha/yr harvested X 1200 st/ha planted X $.30/tree =) $648,000/yr.<br>Fertilizing at the time of planting with a "tea bag" may give the same response as larger stock but would be considerably cheaper.<br>Depending on size of stock, could reduce green-up ages and minimum ages by 1 or 2 yrs.</td><td>c) Possibly a 1-2% gain related to green-up and 1-2% related to minimum ages.</td><td></td></tr>
</table>

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[7] Source: participants at district workshop.

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Harv Forecast (000s m3/yr) |
|---|---|---|---|---|
| ♦ | d) fertilizing at the time of planting; (increase) | (d) Insufficient time in workshop to discuss this strategy. | d) Not reviewed. | |
| ♦ | e) brushing for growth enhancement (i.e., not only for survival); (increase) | (e) Currently brushing 1200 ha/yr of backlog sites.<br>MoF small business brushes about 200 ha/yr and licensees about 500 ha/yr to meet basic silviculture obligations. This equates to brushing about 350 ha/yr due to multiple treatments of the same site. Roughly 15% of sites are brushed for survival.<br>Participants agreed there was an opportunity to brush more area for growth, but the effects on green-up are unknown. (The need for further information is noted under "Summary of Information and Research Needs," page 42.) | e) Effects unquantified. | |
| ♦ | f) spacing stands. (maintain) and | (f)TSR1 base case used VDYP to determine regenerated stand yields. TSR2 will use TIPSY yields. Inherent in the use of TIPSY are assumptions about stocking levels. The plan is to identify different densities by analysis unit in 3 000 stems/ha increments based on total stems. This is important as historic levels of spacing are relatively low in this TSA. | More accurate projection of yields. | |
| ♦ | g) repeat fertilize suitable stands on a 15 yr return cycle. | (g) A rough calculation can be done as follows. 60% of species respond to fertilization, 60% of area is **M** site. This indicates approx. 36% of the THLB is suited to fertilization. Constraints on water quality restrict fertilization on a further 40% of the THLB, resulting in approx. (.6 X .36 =) 21% of the THLB being fertilizable. If repeat fertilization results in a 10% volume gain, this would result in (.21 X .1 =) a 2% overall rise in regenerated stand volumes across the entire THLB. On a 15 yr repeat cycle, **this indicates a fertilization program of 3 300 ha/yr** (.21 X 233 800 / 15). This constitutes a rough estimate of the upper bound to fertilization in this TSA. [Does fertilization accelerate mortality in root rot infected stands?] | (g) TSR1 sensitivity analysis indicates that a 10% rise in regen stand vol's results in a 7% rise in LTHL. A 2% rise results in a (.02 X 0.7 =) 1.4% rise in LTHL. | |
| ♦ | h) Managing to target stocking density vs. to minimum density;* | h) Target stocking is 1 200 st/ha vs. minimum of 700 st/ha. Even at target stocking, get patches of heavier stocking which offsets patches of lower stocking. This does not give the same growth as uniform distribution.<br>This strategy was not fully addressed in the workshop due to insufficient time.<br>See 4(b) "voids". | | |

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Harv Forecast (000s m3/yr) |
|---|---|---|---|---|
| ♦ | i) Duff planting;* | i) Insufficient time in workshop to discuss this strategy. | | |
| ♦ | j) Species selection;* | j) Insufficient time in workshop to discuss this strategy. | | |
| ♦ | k) Site preparation;* | k) Insufficient time in workshop to discuss this strategy. | | |
| ♦ | l) Prune white pine to reduce blister rust losses;* | l) White pine is approx. 2% of inventory. The FP code pruning obligation applies only to naturally regenerated Pw; planted Pw being bred for disease resistance. This is about 50-100 ha/yr. **Post free growing could do a 2<sup>nd</sup> lift prune on about 100 ha/yr.** | l) Not likely to affect harvest levels so much as maintain Pw as part of the species profile. | |
| ♦ | m) Rehab of residual stands.* | m) Insufficient time in workshop to discuss this strategy. | | |
| ♦ | Summary | From the above, it would appear a 15-20% gain in regenerated stand volumes is achievable. | 4. Summary<br>Sensitivity analysis indicates a 10 yr increase in regen stand vol's will result in a 7% increase in mid term harvest levels. A 15% gain = (.15 X .7) ⇒ 10%;<br>Increased site productivity may further compound these effects. | |

## Potential Harvest Forecast

Figure 7 graphs the potential harvest level that may be attained through implementation of the silvicultural strategies in the preceding tables. ***This forecast is highly speculative and requires confirmation through computer-based modeling and analysis***. It also includes silvicultural activities that are not within the traditional scope of incremental silviculture. Modeling may indicate more precise timing, targeting and program levels associated with incremental silviculture activities than could be developed in this interim strategy.

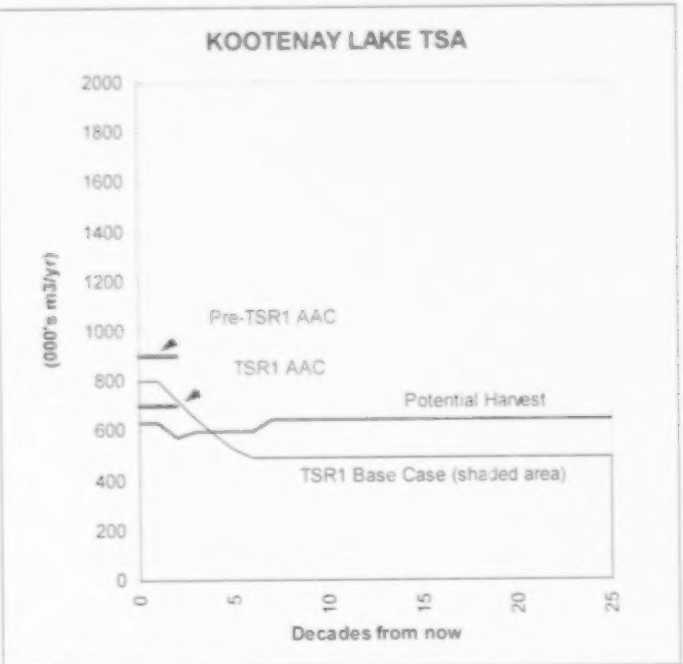


**Figure 7. Potential harvest forecast, Kootenay Lake TSA**

**NB:** The potential harvest forecast in Figure 7 contains adjustments to the TSR1 base case to recognize recent land use planning decisions as well as new information since then. The short term recognizes the TSR1 AAC as the starting point and is adjusted downwards for protected area removals. In addition to these, the long term recognizes expected increases from managed stands as well as improved knowledge about site indices. Thus the two forecasts are not directly comparable.

# *Opportunities to Improve Timber Quality*

The effects of incremental silviculture on the future quality of the timber resource were not analyzed in the timber supply review. Information in this section was gathered during the district workshop.

## Product Objectives

For the Kootenay Lake TSR1 analysis, minimum harvestable ages were based on a minimum volume of 150 m3/ha for conventional ground skidder operations, (200 m3/ha for cable yarding on slopes >50%) and then adjusted according to a combination of local industry and MoF experience. In the district workshop, Crestbrook reported it is harvesting in 80 year-old stands with volumes of 80m3/ha in the Creston area. Slocan FP is operating in higher volume stands in the northern portion of the TSA.

The following are product objectives at the log level for the Kootenay Lake TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log**: | Douglas-fir, lodgepole pine, larch | suitable for achieving machine stress rated (MSR) lumber grading - grown in higher density stands (slower growth rate less of an issue than density) |
| | Douglas-fir, spruce peelers | clear or few tight knots. |
| | white pine, clear | 17.5+ cm min diameter at breast ht (DBH), manually or naturally pruned, min 5.2 m log. |
| | cedar, tight knot or clear | 30+ cm min DBH, naturally pruned. |
| | white pine, large timber | 40+ cm min DBH, unpruned. |
| | lodgepole pine, large timber | 30+ cm min DBH, 15 m min length, 20 cm + top. |
| | spruce, large timber | 45+ cm min DBH. |

**Sawlog**: Minimum average stand DBH of 17.5 cm and min. stand vol. of 150 m3/ha.

While smaller sawlogs are being harvested in the TSA, the cost of harvesting decreases and product recovery increases with increasing size and volume. The sawlog target definition is therefore larger than minimum harvestable size.

## Available Information Regarding Potential Treatments and Treatable Area

| Treatment | Comment/ Potential Treatment Regimes | Treatable Area |
|---|---|---|
| ◆ Spacing | | |
| ◆ Commercial Thinning | | |
| ◆ Pruning | Pruning has the potential to increase the **value** of the wood being produced, although **volume** increases are not expected. Pruning lower limbs increases the density of the wood and produces clear knot-free lumber which is more valuable than normal lumber. Pruning however, has the potential to alter hydrologic recovery and impact visual quality, because it removes a portion of the tree crowns, thereby reducing crown closure. Accordingly, pruning should be avoided or at least applied selectively. Snow interception and hiding cover for wildlife will also be reduced in pruned stands. Pathological pruning for control of white pine blister rust should be continued to reduce the potential for mortality in young stands.<br>Due to the forest cover constraints of the various resources, considerable timber will not be harvested at it's biological rotation, but rather at older ages. These older stands will produce high value clear lumber naturally. In terms of timber supply, pruning is therefore a lower priority than juvenile spacing or fertilization | |

| Treatment | Comment/ Potential Treatment Regimes | Treatable Area |
|---|---|---|
| | in this TSA, with the exception of pathological pruning of white pine. | |

## Potential Strategies by Response Time Frame

The following strategies have potential to increase timber quality. These were identified in the district workshop, but not thoroughly discussed due to insufficient time. The response time frame is the period in which the anticipated result is expected, <u>not</u> the period in which actions must commence.

<table>
<tr><th>Response Time Frame</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th><th>Premium Log Forecast</th></tr>
<tr><td>◆ Short Term (1 - 20 yrs)</td><td>None</td><td>Short term harvests will come from existing older stands which are not treatable to improve quality.</td><td>Quality profile of existing old growth will prevail. Assume this is equal to a recent coast-wide estimate of 15%.</td><td>15%?</td></tr>
<tr><td>◆ Mid Term (21 - 60 yrs)</td><td>Q1. Space 500 ha/yr to obtain large dimension timber and prepare stands for fertilization and commercial thinning.</td><td>1. Avg. annual area harvested = 2 000 ha Assume spacing program of 500 ha/yr, a future species profile as recorded under strategy 4(a), <b>average TSR1 harvest age of 160 years for Sw & Fd, and 120 yrs for Pl</b>. Assume 250 ha/yr spacing in S, 200 in Pl and 50 in Fd (limited by root rot). Minor species (Cw,Hw) not analyzed.<br><br>%'s ≥ min DBH cm (Y cm) and ≥ 1.33 X min DBH (Z cm) are from TIPSY stock table, rounded to nearest 5%. Fd large log assumed = S large log. For Fd & S: Y = 45 cm, Z = 60 cm. For Pl: Y =30 cm, Z = 40 cm<br><br>For trees between Y and Z cm, bottom 5m log is considered large diameter and = 20% of tree vol. For trees ≥ Z cm, first two 5 m logs are considered large diameter and = 35% of tree vol.<br><br>% large = {(Area/2000) X (%≥ Y cm & < Z cm) X (20% of tree vol.)} + {(Area/2000) X (%≥ Z cm) X (35% of tree vol.)}
<table>
<tr><th>Species</th><th>SI</th><th>Hrvst Age</th><th>Space frm: /to</th><th>Area</th><th>% ≥ Y <Z cm</th><th>% > Z</th><th>% large</th></tr>
<tr><td>Sw</td><td>17.5</td><td>160</td><td>3000/900</td><td>250</td><td>30</td><td>0</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>unspaced</td><td>550</td><td>10</td><td>0</td><td>1</td></tr>
<tr><td>Pl</td><td>17.5</td><td>120</td><td>4000/900</td><td>200</td><td>60</td><td>15</td><td>2</td></tr>
<tr><td></td><td></td><td></td><td>unspaced</td><td>400</td><td>35</td><td>0</td><td>1</td></tr>
<tr><td>Fdi</td><td>20.0</td><td>160</td><td>3000/900</td><td>50</td><td>45</td><td>5</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>unspaced</td><td>350</td><td>35</td><td>0</td><td>1</td></tr>
<tr><td>Total</td><td></td><td></td><td></td><td>1800</td><td></td><td></td><td>7</td></tr>
</table></td><td>1. 7-10% premium (large) log content, 4% from spaced stands and 2% from unspaced stands. Although only 25% of stands are spaced, these stands produce twice as much large log volume as the 75% of stands that are unspaced. Pl stands show a significant diameter response to spacing with no loss of merchantable volume.<br><br>If another 200 ha/yr are spaced and later CT'd, the premium log content may rise to 9-10%.<br><br>Note: For an interior TSA the definitions of large premium logs are on the high side. Were the definitions to be lowered, the % premium would measurably increase.</td><td>7% premium logs, some of which will also be clear.</td></tr>
<tr><td>◆ Long Term (61 + yrs)</td><td>As above.</td><td>As above.</td><td>As above.</td><td>7%</td></tr>
</table>

## Timber Quality Forecast

The foregoing analysis indicates the premium log content of harvests in the mid and long term will be lower than today's levels (7% forecast vs. current estimate of 15%). The largest factor contributing to this premium log achievement is the delay in average harvest ages brought about by the highly constrained nature of this TSA. (To illustrate, the LTHL for the Kootenay Lake TSA is 26% below the long run sustained yield (LRSY), whereas in most other TSA's it is usually in the order of 10-15% below.)

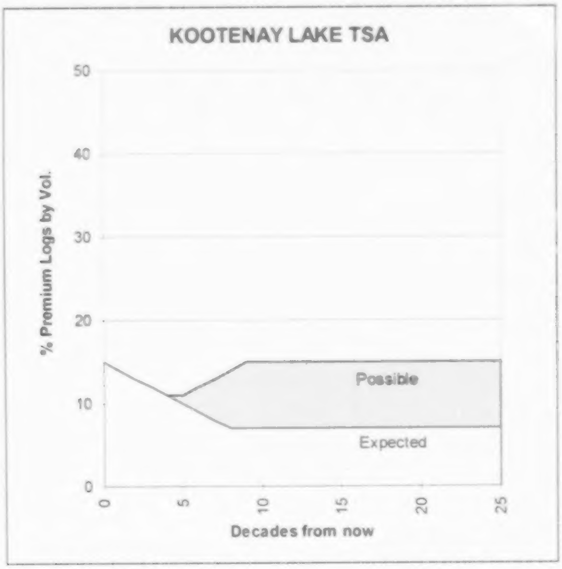


Figure 8. Potential Quality Forecast, Kootenay Lake TSA

This quality forecast is for large-dimension premium logs. Large logs are projected to be 7% of future harvests, based on spacing 500 ha/yr. If an additional 200 ha/yr are spaced for CT this may rise to the 10% range. Some large logs will also be clear logs, but no estimate for the clear component is available.

Were large log definitions relaxed to more toward the norm for interior stands and the area spaced for the purpose of setting up stands for future commercial thinning included, the future premium log component may possibly approach today's (presumed) level of 15%.

# ***Incremental Silviculture Strategy***

This section synthesizes the preceding background information and analysis into an incremental silviculture strategy for the TSA.

## General Strategy

Better resource information and accelerated tree improvement offer the two greatest possibilities for increasing future harvest levels in the Kootenay Lake TSA. The first may result in an increased land base, while the second will shorten green-up periods as well as increase regenerated stand volumes.

Elimination of the NSR backlog was assumed in the TSR1 base case and its accomplishment is necessary to maintain that forecast and the AAC on which it was founded.

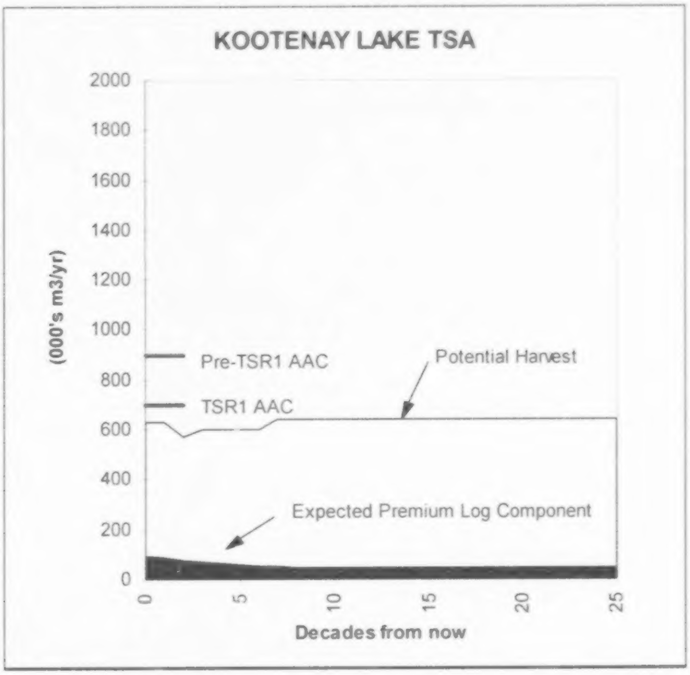
Spacing will improve the future quality of the timber resource and should also be used to set up stands for future commercial thinning. Commercial thinning may offer opportunities to restructure the harvest queue, thereby assisting in overcoming adjacency limitations and increasing the harvest level during the critical time period 3-5 decades from now. Further analysis is required to confirm the CT potential as well as determine target stands.

Reducing losses to root rot is being addressed through silviculture prescriptions and actions required under the Forest Practices Code. Incremental silviculture activities can supplement this to bring losses to reasonable levels.

## Working Targets

The preceding analysis indicates the following working targets (WT) are attainable. Figure 9 illustrates these.

| | |
|---|---|
| **WT 1 (Quantity)**: | Manage long term timber supply to yield harvest levels of 650 million m3/yr. |
| **WT 2 (Quality)**: | Manage regenerated stands to yield at least 10% premium logs by volume, with the majority of the remainder being of sawlog quality. |



See notes beside Figure 7, page 34, and Figure 8, page 38.

**Figure 9. Combined Potential Quantity and Quality Harvest Forecasts, Kootenay Lake TSA**

Draft

## Log Product Objectives

The following are product objectives at the log level for the Kootenay Lake TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | Douglas-fir, lodgepole pine, larch | suitable for achieving machine stress rated (MSR) lumber grading - grown in higher density stands (slower growth rate less of an issue than density) |
| | Douglas-fir, spruce peelers | clear or few tight knots. |
| | white pine, clear | 17.5+ cm min diameter at breast ht (DBH), manually or naturally pruned, min 5.2 m log. |
| | cedar, tight knot or clear | 30+ cm min DBH, naturally pruned. |
| | white pine, large timber | 40+ cm min DBH, unpruned. |
| | lodgepole pine, large timber | 30+ cm min DBH, 15 m min length, 20 cm + top. |
| | spruce, large timber | 45+ cm min DBH. |

**Sawlog:** Minimum average stand DBH of 17.5 cm and min. stand vol. of 150 m3/ha.

## Silviculture Strategies

The following strategies have identified potential to maintain and/or increase the quantity and quality of the timber supply of the Kootenay Lake TSA. Strategy numbers correspond with those recorded earlier. Potential strategies found to be not applicable are omitted, resulting in gaps in strategy numbering.

### ◆ Strategies to Increase the Quantity of Future Timber Supply

Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them.

These strategies are supported by specific silvicultural regimes, listed on page 43 along with investment priorities. The priority column below is based on regime rankings. Due to insufficient time, the regime table was not fully completed in the workshop. Consequently, some priorities were assigned post workshop. Generally, only the high priority strategies are listed in the "STRATEGY AT A GLANCE" section.

| No. | Strategy | Priority |
|---|---|---|
| ***Short Term*** | | |
| **ST1** | Fertilize 100 ha/yr of suitable stands scheduled for harvest in the 2nd decade. (increase) | low |

| No. | Strategy | Priority |
|---|---|---|
| ***Mid Term*** | | |
| **MT1** | Overcome forest cover constraints by (a) reducing time to green-up through the use of large improved stock and (b) implementing a regime of spacing 200 ha/yr and fertilizing 60 ha/yr of spaced stands (both commencing immediately) and commercial thinning (commencing in about 30 years) in all zones, (c) particularly in the VQO zone. (increase).<br>*Further analysis is required to refine the spacing/CT strategy and locate target stands.* | (a) high<br>(b) high<br>(c) medium |
| **MT2** | Repeat fertilize all suitable existing stands scheduled for harvest 20 to 100 years from now to increase harvested volumes. | low |
| **MT3** | Commercially thin stands to create old-seral attributes earlier. (increase)<br>*Research is required to determine desired attributes and the silvicultural mechanisms to achieve them.* | medium |
| ***Long Term*** | | |
| **LT1** | (a)Rehabilitate all remaining treatable backlog NSR - 1 800 ha (maintain); and | (a) high |
| | (b) maintain 5 000 ha of existing backlog plantations. (maintain) | (b) high |
| **LT2** | Increase the THLB by: | |
| | (b) converting /rehabilitating 5 000 ha of deciduous stands; (increase) | (b) high |
| | (d) inventorying low site stands to determine if correctly classified and to enable development of silvicultural strategies to improve the productivity of some stands. | (d) high |
| **LT3** | Reduce losses to root rot through pop-up spacing 100 ha/yr (other solutions lie within the basic silviculture domain). | high |
| **LT4** | Increase the volume of regenerated stands 15% by: | |
| | (a) using improved seed; (increase) | (a) high |
| | (c) using larger planting stock; (increase) | (c) low |
| | (e) brushing for growth enhancement | (e) medium |
| | (l) 2nd lift pruning 100ha/yr of white pine to reduce blister rust losses. | (l) medium |

### ♦ Strategies to Increase the *Quality* of Future Timber Supply

| No. | Strategy | Priority |
|---|---|---|
| **Q1** | Space 500 ha/yr to obtain large dimension timber and prepare stands for fertilization. | Medium |

### ♦ Strategies to Increase the *Quantity* or *Quality* of Future Habitat Supply

Strategies to address habitat supply were not discussed in the district workshop due to insufficient time. Concerns expressed were:

(a) The truncation of the early seral stage of stands if there is a move to harvest younger stands.

(b) The conversion of species (e.g., more spruce and less cedar and hemlock, the conversion of deciduous stands to coniferous).

## Summary of Information and Research Needs

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for an incremental silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 23).

1. Further study of root rot management techniques and options are needed. (MT1b, LT3)
2. Silviculture treatments may be used to create suitable stand structures or create old growth recruitment areas. There is a lack of knowledge about these structures and attributes. More refined definitions are needed before strategies can be developed. (MT3)
3. A survey of opportunities and prescriptions for the conversion of aspen stands to coniferous stands are needed. (LT2b)
4. Yield curves are needed for deciduous stands to improve their consideration in forest estate planning. (LT2b)
5. An inventory and re-classification of low site stands is needed. (LT2d)
6. OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (LT4b)
7. More information about the opportunities and effects of brushing young stands to improve growth (vs. for survival as is current practice) is needed. (LT4e)

## Silviculture Regimes and Investment Priorities

The following table indicates incremental silviculture regimes which are suitable to attaining the above working targets and strategies.

## Table 1. Regime Table for the Kootenay Lake TSA, developed at the Silviculture Planning Workshop, November 23-24,1998.

| Regimes | Strategy | Opportunity Area (Ha/Yr) | Timber Supply Effects Short | Timber Supply Effects Medium | Timber Supply Effects Long | Quality | ES | Habitat | Forest Health | Jobs Days/ha | Direct Cost $/ha | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Survey** | | 18360 | | | | | | | | 0.1 | 25 | |
| **Backlog** | | | | | | | | | | | | 2 |
| 1 establishment | L1a | 360 | + | ++ | + | 0 | +/- | +/- | 0 | 8 | 2200 | |
| 2 maintainance | L1b | 1000 | ++ | + | 0 | 0 | +/- | +/- | 0 | 2.5 | 600-800 | |
| **Increase Land Base** | | | | | | | | | | | | 1 |
| 3 convert decid | L2b | 100 | + | +/- | + | 0 | +/-/? | +/-/? | 0 | 2.5 | 600-800 | |
| 4 inventory low site[1] | L2d | | | | | | | | | | | |
| **Pre Free Growing** | | | | | | | | | | | | |
| 5 large stock | L4c | | | | | | | | | | | |
| 6 fertilize at planting | L4d | | | | | | | | | | | |
| 7 brush for growth | L4e | | | | | | | | | | | |
| 8 manage for target stocking | L4h | | | | | | | | | | | |
| **Spacing** | | | | | | | | | | | | |
| 9 spacing (for quality)[2] | Q1 | 500 | 0 | 0 | 0 | + | + | + | + | 3 | 800 | |
| 10 spacing (space/fert/CT/fert) | M1 | 200 | + | ++ | 0 | + | + | + | + | 3 | 800 | |
| 11 spacing (habitat) | | | 0 | 0 | 0 | + | + | + | + | 3 | 800 | |
| **Fertilization** | | | | | | | | | | | | 4 |
| 12 fertilize maximum[3] | L4q | 3300 | | | | | | | | | | |
| 13 fertilize (second decade harvest) | S1,M2 | 100 | ++ | ++ | + | + | 0 | 0/+ | 0 | 0.1 | 250 | |
| 14 1st fertilize (space/fert/CT/fert) | M1 | 60 | + | ++ | + | + | 0 | 0/+ | 0 | 0.1 | 250 | |
| **Commercial Thinning** | | | | | | | | | | | | 3 |
| 15 CT (space/fert/CT/fert)[4] | M1 | 300 | | | | | | | | | | |
| 16 CT(old seral) | M3 | Need more info | + | 0 | 0 | + | + | + | + | | | |
| 17 CT(natural stands) | | | ++ | + | 0 | 0 | + | + | + | | | |
| **Pruning** | | | | | | | | | | | | 5 |
| 18 Pw (2nd lift) | L4l | 100 | + | + | ? | + | 0 | 0 | 0 | 4 | 1000 | |
| **Forest Health** | | | | | | | | | | | | |
| 19 pop-up spacing | L3 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | + | 3 | 600-800 | |
| 20 species conversion | | | 0 | 0 | 0 | 0 | - | - | + | 2.5 | 600-800 | |

To Do List (#1 rank)

1 Inventory and quantify opportuities for low volume stands

2 Determine a program to (either/both) reduce greenup age or overcome adjacency requirements in decades 3-5

Notes

[1] Not a silviculture activity. Once the characteristics of low sites are quantified, a silviculture strategy to raise productivity may be possible

[2] For the puposes of this strategy/analysis, this is considered separate and not overlapping with other spacing strategies

[3] Fertilization regimes are likely to overlap. This regime (3 300 ha/yr) is the maximum that could be applied based on repeat fertilization of suitable areas across the entire THLB

[4] 300 ha/yr of CT per year is likely the upper bound of CT potential. Other CT regimes presented below would be more focussed subsets of this regime

## Incremental Silviculture Program

The following annualized program will contribute to achieving the above goals and strategies.

**Program Table - Ha, Kootenay Lake TSA, November 1998**

| Year | Surveys | Backlog Planting | Backlog Brushing | Stand Conversion | Space | Fertilize | Prune |
|---|---|---|---|---|---|---|---|
| 1 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| 2 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| 3 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| 4 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| 5 | 18,360 | 360 | 1,000 | 100 | 800 | 160 | 100 |
| Subtot Yr 1 - 5 | 91,800 | 1,800 | 5,000 | 500 | 4,000 | 800 | 500 |
| 6 - 10 | 91,800 | - | 3,750 | 500 | 4,000 | 800 | 500 |
| Total Yr 1 - 10 | 183,600 | 1,800 | 8,750 | 1,000 | 8,000 | 1,600 | 1,000 |

* Includes prescription and layout

| Unit cost ($/ha) | 25 | 2,200 | 700 | 700 | 800 | 250 | 1,000 |
|---|---|---|---|---|---|---|---|

**Program Table - $ 000s, Kootenay Lake TSA, November 1998**

| Year | Surveys | Backlog Planting | Backlog Brushing | Stand Conversion | Space | Fertilize | Prune | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 459 | 792 | 700 | 70 | 640 | 40 | 100 | 2,801 |
| 2 | 459 | 792 | 700 | 70 | 640 | 40 | 100 | 2,801 |
| 3 | 459 | 792 | 700 | 70 | 640 | 40 | 100 | 2,801 |
| 4 | 459 | 792 | 700 | 70 | 640 | 40 | 100 | 2,801 |
| 5 | 459 | 792 | 700 | 70 | 640 | 40 | 100 | 2,801 |
| Subtot Yr 1 - 5 | 2,295 | 3,960 | 3,500 | 350 | 3,200 | 200 | 500 | 14,005 |
| 6 - 10 | 2,295 | - | 2,625 | 350 | 3,200 | 200 | 500 | 9,170 |
| Total Yr 1 - 10 | 4,590 | 3,960 | 6,125 | 700 | 6,400 | 400 | 1,000 | 23,175 |

## Job Outcomes

The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets.

**Program Job Outcomes, Kootenay Lake TSA, November 1998**

***Short term*** *employment associated with undertaking the silviculture activity, in person years*

| Year | Surveys | Backlog Planting | Backlog Brushing | Backlog Conversion | Space | Fertilize | Prune | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 9 | 14 | 13 | 1 | 12 | 0 | 2 | 51 |
| 2 | 9 | 14 | 13 | 1 | 12 | 0 | 2 | 51 |
| 3 | 9 | 14 | 13 | 1 | 12 | 0 | 2 | 51 |
| 4 | 9 | 14 | 13 | 1 | 12 | 0 | 2 | 51 |
| 5 | 9 | 14 | 13 | 1 | 12 | 0 | 2 | 51 |
| Subtot Yr 1 - 5 | 46 | 72 | 63 | 6 | 60 | 0 | 10 | 257 |
| 6 - 10 | 46 | - | 47 | 6 | 60 | 0 | 10 | 169 |
| Total Yr 1 - 10 | 92 | 72.0 | 109.4 | 12.5 | 120.0 | 0.8 | 20.0 | 426 |

Note: Assumes 200 days of silviculture work = 1 job (Source: Jobs and Timber Accord)

***Long term*** *employment associated with improved quality and quantity of the timber resource*[1]

| Decade | Harvest Increment ('000 m3) | Incremental Jobs | | | |
|---|---|---|---|---|---|
| | | per year by decade | | Total by decade | |
| | | TSA[2] | Prov[3] | TSA[2] | Prov[3] |
| 1 | | - | - | | |
| 2[4] | | - | - | - | - |
| 3 | | - | - | - | - |
| 4 | 13 | 20 | 30 | 203 | 295 |
| 5 | 72 | 112 | 163 | 1,123 | 1,634 |
| 6 | 109 | 170 | 247 | 1,700 | 2,474 |
| 7 | 153 | 239 | 347 | 2,387 | 3,473 |
| 8 | 153 | 239 | 347 | 2,387 | 3,473 |
| 9 | 153 | 239 | 347 | 2,387 | 3,473 |
| 10 | 153 | 239 | 347 | 2,387 | 3,473 |
| 11 | 153 | 239 | 347 | 2,387 | 3,473 |
| 12 | 153 | 239 | 347 | 2,387 | 3,473 |
| 13 | 153 | 239 | 347 | 2,387 | 3,473 |
| 14 | 153 | 239 | 347 | 2,387 | 3,473 |
| 15 | 153 | 239 | 347 | 2,387 | 3,473 |
| 16 | 153 | 239 | 347 | 2,387 | 3,473 |
| 17 | 153 | 239 | 347 | 2,387 | 3,473 |
| 18 | 153 | 239 | 347 | 2,387 | 3,473 |
| 19 | 153 | 239 | 347 | 2,387 | 3,473 |
| 20 | 153 | 239 | 347 | 2,387 | 3,473 |
| 21 | 153 | 239 | 347 | 2,387 | 3,473 |
| 22 | 153 | 239 | 347 | 2,387 | 3,473 |
| 23 | 153 | 239 | 347 | 2,387 | 3,473 |
| 24 | 153 | 239 | 347 | 2,387 | 3,473 |
| 25 | 153 | 239 | 347 | 2,387 | 3,473 |
| Total | | | | 48,376 | 70,393 |

Notes:

1. Assumes continuation of on the incremental silvicture program beyond the first 10 years, in accordance with the strategy. The total harvest increment is associated with all the silvicultural practices documented in the "Opportunities" section and is only partly attributable to spacing and fertilization practices. Some of the increase may be associated with pre-free growing silviculture that was not current practice at the time of TSR1.

2. Assumes 1.56 TSA level harvesting and prcessing jobs (PYs) per 1000 cubic metre (Source: Sinclair Tedder, BC MoF, 1998, pers.com.)

3. Assumes 2.27 Provincial level harvesting and prcessing jobs (PYs) per 1000 cubic metre (Source: Sinclair Tedder, BC MoF, 1998, pers.com.)

4. Decades 2 & 3 have negative harv increments due to adjustments to TSR1 AAC & land base reductions. These are exluded from the jobs table.

## References

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## Abbreviations

The following abbreviations are used.

| | |
|---|---|
| AAC | allowable annual cut |
| CF | chief forester |
| CRMP | co-ordinated resource management plan |
| CT | commercial thinning |
| DBH | diameter at breast height |
| ECA | equivalent clearcut area |
| ESSF | engelmann spruce - subalpine fir (ecological zone) |
| FCC | forest cover constraints |
| FRBC | Forest Renewal BC |
| ICH | interior cedar-hemlock (ecological zone) |
| IHL | initial harvest level |
| KBLUP | Kootenay-Boundary Land Use Plan |
| KLFD | Kootenay Lake Forest District |
| LRSY | long run sustained yield |
| LT | long term |
| LTHL | long term harvest level |
| MoF | Ministry of Forests |
| MS | montane spruce (ecological zone) |
| MSR | machine stress rated |
| MT | mid term |
| NCBr | non-commercial brush |
| NCC | non-commercial cover |
| NSR | not satisfactorily restocked |
| OAF | operational adjustment factor |
| OGSI | old growth site index |
| PFT | problem forest type |
| SBFEP | small business forest enterprise program |
| ST | short term |
| TASS | tree and stand simulator |
| TFL | tree farm licence |
| THLB | timber harvesting land base |
| TIPSY | table interpolation program for stand yields |
| TSA | timber supply area |
| TSR | timber supply review |
| VDYP | variable density yield projection |
| VQO | visual quality objective |
| WT | working target |

Species abbreviations: B or Ba - balsam fir; Cw - western redcedar; Fdi - interior Douglas-fir; Hw - western hemlock; Pl - lodgepole pine; Lw - western larch; S - spruce species.

Site class abbreviations: G - good; M - medium; P - poor.

# Instructions

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c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** Kootenay Lake TSA

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# Kootenay Lake TSA
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| **Activities** | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |
| **Forest Health Enhancement** | | | | | | | |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 10 | 0 | 0 | 0 | 0 | 500.00 | 5000 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 10 | 0 | 0 | 0 | 0 | 499.90 | 5,000 |
| **Habitat Supply and Biodiversity Enhancement** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Domestic Range** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Enhanced Forestry Activities - Management Unit Total** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 10 | 0 | 0 | 0 | 0 | 499.95 | 5,000 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 10 | 0 | 0 | 0 | 0 | 499.55 | 5,000 |
| Planning and prescriptions | | | | | | | 0 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 5,000 |

**Notes:**

1. Pw pruning for survival, to ensure stands remain SR; and will attain free growing.

# Kootenay Lake TSA
# Backlog Program Table
# For the 2001/02 Fiscal Year

| **Activities** | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Legal Obligations** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 400 | 400 | 400 | 300 | 300 | 35.00 | 14000 |
| Site preparation | 50 | 25 | 25 | 12 | 12 | 1,230.00 | 61500 |
| Planting | 125 | 76 | 100 | 100 | 100 | 586.40 | 73300 |
| Brushing | 320 | 300 | 300 | 300 | 300 | 746.56 | 238900 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 895 | 801 | 825 | 712 | 712 | 433.18 | 387,700 |
| Seed purchase | 116060 | 0 | 0 | 0 | 0 | 0.33 | 38300 |
| **Total legal obligations** | | | | | | | 426,000 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 3320 | 3000 | 3000 | 3000 | 3000 | 35.00 | 116193 |
| Site preparation | 150 | 75 | 75 | 38 | 38 | 1,230.00 | 184500 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 3470 | 3075 | 3075 | 3038 | 3038 | 86.65 | 300,693 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 20,000 |
| **Total backlog reforestation** | | | | | | | 320,693 |
| **Impeded areas** | | | | | | | |
| Surveys | 0 | 200 | 200 | 200 | 200 | 0.00 | 0 |
| Brushing | 117 | 120 | 120 | 120 | 120 | 905.98 | 106000 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 117 | 320 | 320 | 320 | 320 | 905.97 | 106,000 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 106,000 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | | | | | 0.00 | 0 |
| Rehabilitation | 40 | 40 | 40 | 40 | 40 | 500.00 | 20000 |
| Reforestation | 0 | 40 | 40 | 40 | 40 | 0.00 | 0 |
| **Totals hectares** | 40 | 80 | 80 | 80 | 80 | 499.98 | 20,000 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 20,000 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 3720 | 3600 | 3600 | 3500 | 3500 | 35.00 | 130193 |
| Site preparation | 240 | 140 | 140 | 90 | 90 | 1,108.33 | 266000 |
| Planting | 125 | 116 | 140 | 140 | 140 | 586.39 | 73300 |
| Brushing | 437 | 420 | 420 | 420 | 420 | 789.24 | 344900 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 4522 | 4276 | 4300 | 4150 | 4150 | 180.10 | 814393 |
| Seed purchase | 116060 | 0 | 0 | 0 | 0 | 0.33 | 38300 |
| Prescriptions and planning | | | | | | | 20,000 |
| **Recommended studies** | 1-Sx | | | | | | 5,000 |
| **Total backlog program** | | | | | | | 877,693 |

* Seed purchase includes seedlings purchase. Units are number of seedlings.

**Notes:**

1. Site restoration will have a legal obligation, once treatments commence, as SP required.
2. For 2001/02 $5,000 in Enhance Forestry will bring total SH C25funding to $622, 954 (80% level).

12/5/2005

## Kootenay Lake Forest District

**Instructions for developing the Performance Measures Table for FRBC Investments**

**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

***The following default provincial factors may be replaced by management unit specific factors.***

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| **Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| **Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| **Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

***Area affected by tree improvement, seedling production and silviculture surveys***

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | **Tree Improvement** | **Nursery Seedling Production** | **Silviculture Surveys** |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 125 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 125 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 116,060 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 3,720 |
| 33% of all silviculture surveys | | | 1,228 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | 1,500 |
| Estimate area of free growing surveys | | | 2,220 |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 3,720 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 3,720 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR) | | | |
| Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | 200 |

| Improve-ment | Seedling Production | Surveys | Preparation | Plant | | | | | staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.

The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | **Tree Improve-ment** | **Nursery Seedling Production** | **Silviculture Surveys** |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 125 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 125 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 116,060 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 3,720 |
| 33% of all silviculture surveys | | | 1,228 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | 1,500 |
| Estimate area of free growing surveys | | | 2,220 |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply (A) | | | 3,720 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 3,720 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)<br>Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | 200 |
| Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)<br>Estimate area that will be classified as free growing after a survey in 2001/2002 | | | 1,200 |

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

| | |
|---|---|
| Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity. | 76 |

# Kootenay Lake Forest District:
## Performance Measures Based on Activities Planned for 2001/2002

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 125 | 116,060 | 3,720 | 240 | 125 | 437 | 0 | 10 | 0 | 120,717 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 3,331 | 0 | 111,953 | 0 | 17,063 | 7,101 | 0 | 0 | 0 | | 139,449 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 200 | | | | | | | | 200 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 1,200 | | | | | | | | 1,200 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 13 | 39,460 | 372 | 240 | 250 | 1,141 | 0 | 45 | 0 | 12,072 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 219 | 2 | 1 | 1 | 6 | 0 | 0 | 0 | 67 | 298 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 10 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 76 |

# Kootenay Lake TSA
# Management Unit Summary Table
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 10 | 0 | 0 | 0 | 0 | 500 | 5,000 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| Backlog Program Field Activities | 4,522 | 0 | 0 | 0 | | 180 | 814,393 |
| Planning, prescriptions and seedlings | | | | | | | 63,300 |
| **Totals** | 4,532 | 0 | 0 | 0 | 0 | | 882,693 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 139,449 $m^3$ |
| Estimated ha that will be reclassified as stocked | 200 ha |
| Estimated ha that will be declared as free growing | 1,200 ha |
| Estimated total full time equivalent positions generated | 298 FTEs |
| Forest health enhancement area | 10 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 76 ha |

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Multiple districts that make up a management unit will be summarized by the region.

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3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
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# Nelson Forest Region
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| **Activities** | **Treatment Area Goals (ha)** | | | | | **Plan 2001/02** | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 1333 | 3650 | 3650 | 3650 | 3650 | 29.66 | 39539 |
| Spacing | 1182 | 1069 | 936 | 979 | 972 | 642.63 | 759583 |
| Pruning | 41 | 131 | 175 | 137 | 131 | 1320.27 | 54131 |
| Fertilizing | 359 | 300 | 800 | 300 | 800 | 243.75 | 87506 |
| Other | 350 | 0 | 0 | 0 | 0 | 53.14 | 18,599 |
| **Totals hectares** | 3265 | 5150 | 5561 | 5066 | 5553 | 293.83 | 959,358 |
| Planning and prescriptions | | | | | | | 59,500 |
| **Total dollars** | | | | | | | 1,018,858 |

## Forest Health Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 26 | 150 | 150 | 150 | 150 | 500.00 | 13000 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | ######### | 7500 |
| **Totals hectares** | 26 | 150 | 150 | 150 | 150 | 788.40 | 20,500 |

## Habitat Supply and Biodiversity Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Domestic Range

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Enhanced Forestry Activities - Management Unit Total

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surveys | 1333 | 3650 | 3650 | 3650 | 3650 | 29.66 | 39,539 |
| Spacing | 1182 | 1069 | 936 | 979 | 972 | 642.62 | 759,583 |
| Pruning | 67 | 281 | 325 | 287 | 281 | 1,001.96 | 67,131 |
| Fertilizing | 359 | 300 | 800 | 300 | 800 | 243.75 | 87,506 |
| Other stand tending activities | 350 | 0 | 0 | 0 | 0 | 74.57 | 26099 |
| **Totals hectares** | 3291 | 5300 | 5711 | 5216 | 5703 | 297.74 | 979,858 |
| Planning and prescriptions | | | | | | | 59,500 |
| **Studies funding** | | | | | | | 150000 |
| **Total dollars** | | | | | | | 1,189,358 |

12/5/2005

# Nelson Forest Region
# Backlog Program Table
# For the 2001/02 Fiscal Year

| **Activities** | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| **Legal Obligations** | | | | | | | |
| Surveys | 3009 | 2366 | 2705 | 1975 | 1449 | 29.00 | 87259 |
| Site preparation | 50 | 25 | 25 | 12 | 12 | 1,230.00 | 61500 |
| Planting | 992 | 393 | 150 | 100 | 100 | 623.69 | 618700 |
| Brushing | 1327 | 1167 | 1037 | 865 | 784 | 619.57 | 822167 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 5378 | 3951 | 3917 | 2952 | 2345 | 295.58 | 1,589,626 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | ########### | 56600 |
| **Total legal obligations** | | | | | | | 1,646,226 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 15731 | 18219 | 13869 | 9341 | 9488 | 26.39 | 415177 |
| Site preparation | 352 | 125 | 75 | 38 | 38 | 827.50 | 291280 |
| Planting | 248 | 200 | 375 | 360 | 160 | 507.42 | 125840 |
| Brushing | 553 | 538 | 437 | 317 | 204 | 499.59 | 276273 |
| **Totals hectares** | 16884 | 19082 | 14756 | 10056 | 9890 | 65.66 | 1,108,570 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | ########### | 156,358 |
| Prescriptions and planning dollars | | | | | | | 84,009 |
| **Total backlog reforestation** | | | | | | | 1,348,937 |
| **Impeded areas** | | | | | | | |
| Surveys | 7231 | 4520 | 3965 | 3550 | 3550 | 30.96 | 223900 |
| Brushing | 1592 | 980 | 600 | 500 | 500 | 719.23 | 1145007 |
| Density spacing | 17 | 50 | 50 | 50 | 50 | 700.00 | 11900 |
| **Totals hectares** | 8840 | 5550 | 4615 | 4100 | 4100 | 156.20 | 1,380,807 |
| Prescriptions and planning dollars | | | | | | | 101,000 |
| **Total impeded areas** | | | | | | | 1,481,807 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 90 | 40 | 40 | 40 | 40 | 1,000.00 | 90000 |
| Reforestation | 5 | 0 | 0 | 0 | 0 | 600.00 | 3000 |
| **Totals hectares** | 95 | 40 | 40 | 40 | 40 | 978.94 | 93,000 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 11,000 |
| **Total site restoration** | | | | | | | 104,000 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 25971 | 25105 | 20539 | 14866 | 14487 | 27.97 | 726336 |
| Site preparation | 492 | 190 | 140 | 90 | 90 | 899.96 | 442780 |
| Planting | 1245 | 593 | 525 | 460 | 260 | 600.43 | 747540 |
| Brushing | 3472 | 2685 | 2074 | 1682 | 1488 | 646.15 | 2243447 |
| Density spacing | 17 | 50 | 50 | 50 | 50 | 699.96 | 11900 |
| **Totals hectares** | 31197 | 28623 | 23328 | 17148 | 16375 | 133.73 | 4172003 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | ########### | 212958 |
| Prescriptions and planning | | | | | | | 196,009 |
| **Recommended studies** | | | | | | | 5,000 |
| **Total backlog program** | | | | | | | 4,585,970 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

12/5/2005

**Nelson Forest Region**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

## *The following default provincial factors may be replaced by management unit specific factors.*

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| **Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| **Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| **Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 1,245 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 1,245 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 1,333 |
| Total backlog surveys from the backlog table. | | | 25,971 |
| 33% of all silviculture surveys | | | 9,010 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 9,010 |

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)

| | |
|---|---|
| Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | 983 |

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.

The following additional information is needed for tree improvement, seedling production and silviculture surveys

| Area | | |
|---|---|---|
| Tree Improvement | Nursery Seedling Production | Silviculture Surveys |

**A Tree Improvement**

**Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002**

Backlog area planted from backlog table 1,245

Enter area of all other sites planted with improved trees

Total area affected by tree improvement 1,245

**B Nursery production of seedlings**

Enter sowing requests from SPAR

**C Silviculture surveys**

Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.

These potentially provide improved estimates of site productivity and operational yield adjustment factors

Total EFP surveys from the EFP table 1,333

Total backlog surveys from the backlog table. 25,971

33% of all silviculture surveys 9,010

**Optionally, you may provide a more exact estimate:**

Estimate area of regen delay surveys

Estimate area of free growing surveys

Estimate area of pre-stand tending surveys

Estimate of total surveys that will affect timber supply (A) 0

Surveyed area that will affect timber supply

Replace with (A) if a more exact estimate is calculated 9,010

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)

Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 983

Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)

Estimate area that will be classified as free growing after a survey in 2001/2002 7,600

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity.

## Nelson Forest Region

## Performance Measures Based on Activities Planned for 2001/2002

## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improve-ment | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 1,245 | 0 | 9,010 | 492 | 1,245 | 3,472 | 1,199 | 67 | 359 | 17,439 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 33,179 | 0 | 271,166 | 0 | 169,943 | 56,420 | 0 | 0 | 7,234 | | 537,941 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 983 | | | | | | | | 983 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 7,600 | | | | | | | | 7,600 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 125 | 0 | 901 | 492 | 2,490 | 9,062 | 4,748 | 304 | 65 | 1,744 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 1 | 0 | 5 | 3 | 14 | 50 | 26 | 2 | 0 | 10 | 111 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 26 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# Nelson Forest Region
# Management Unit Summary Table
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 3,291 | 5,300 | 5,711 | 5,216 | 5,703 | 298 | 979,858 |
| Planning, prescriptions and seedlings | | | | | | | 209,500 |
| Backlog Program Field Activities | 31,197 | 0 | 0 | 0 | 0 | 134 | 4,172,003 |
| Planning, prescriptions and seedlings | | | | | | | 413,967 |
| **Totals** | 34,488 | 5,300 | 5,711 | 5,216 | 5,703 | | 5,775,328 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 537,941 $m^3$ |
| Estimated ha that will be reclassified as stocked | 983 ha |
| Estimated ha that will be declared as free growing | 7,600 ha |
| Estimated total full time equivalent positions generated | 111 FTEs |
| Forest health enhancement area | 26 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

# Revelstoke
# Timber Supply Area

## Interim Silviculture Strategy

-- Version 1.2 --

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Contents

STRATEGY AT A GLANCE .....i
Introduction.....1
Higher Level Goals and Objectives .....3
Basic Data.....4
Incremental Silviculture History .....5
Issues and Silvicultural Opportunities.....6
Opportunities to Increase Timber Supply .....14
Opportunities to Improve Timber Quality .....28
Incremental Silviculture Strategy.....34
Silviculture Regimes and Investment Priorities .....38
Incremental Silviculture Program .....39
Job Outcomes.....40
Summary of Information and Research Needs.....41
References.....42
Abbreviations.....43
Appendix A: Additional Document Detail.....44
Appendix B: Detailed Issues and Silvicultural Opportunities Analysis.....46

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**British Columbia**
**Ministry of Forests**

**Funded By**

Forest Renewal BC

**March 31, 1999**

# STRATEGY AT A GLANCE

*Purpose*

This strategy is intended to help optimize the application of available funding for silviculture activities towards the goals of improving the future quantity and quality of both habitat and timber supply. The strategy will be considered as one of several inputs in decisions on funding allocations and treatment activities.

*Objectives*

The primary objectives of the silviculture strategy are to:

- increase regenerated stand volumes by 7%;
- space 5 000 ha of stands in the harvest queue for decades 8 and 9 to ensure they will be of merchantable size at that time;
- research the desired stand characteristics for caribou lichen forage production in order to determine the need and opportunity, if any, for silvicultural management of stands for this purpose; and
- partially offset anticipated future lower log quality by pruning 50 ha/yr of suitable young stands (the requirements for significant areas to be in an older forest condition will also contribute to higher quality future stands).

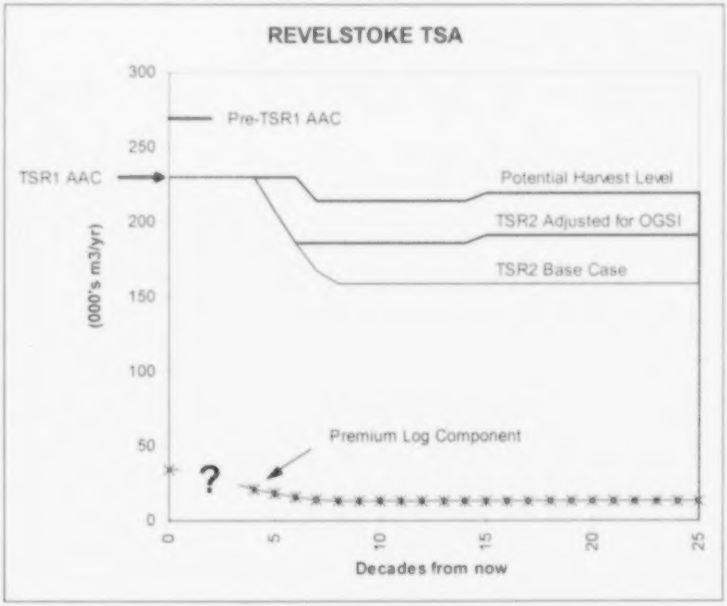
Accomplishing these objectives requires a program substantially above historic levels.

*Working Targets*

**Quantity**: Manage long term timber supply to yield a harvest of 0.22 million m3/yr.

**Quality**: Manage regenerated stands to yield at least 6% (by volume) premium large logs having a 2.5% clear log component, with the majority of the remainder being of sawlog quality.

*The following chart illustrates the above working targets. They represent the plausible high end of the potential of the timber resource relative to the TSR2 base case. Changes to the base case would also effect changes to the potential forecast. These forecasts are interim and require confirmation through analysis and modeling.*



## Product Objectives

The following are product objectives at the log level for the Revelstoke TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | S | 45+ cm minimum average stand diameter at breast height (DBH), some clear wood component. |
| | Hw, Cw | 35+ cm minimum average stand DBH, some clear wood component. |
| **Sawlog:** | All | 25+ cm minimum average stand DBH. |

## Major Silvicultural Strategies

The strategies listed below are those considered in the workshop and follow-up analysis to be appropriate towards achieving the working targets. Other strategies that were considered but found to have no opportunity area are documented in the report.

### Timber Quantity

Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them. (Increase - increase over the second timber supply review (TSR2) base case. Maintain - maintain TSR2 base case)

| No. | Strategy | Priority |
|---|---|---|
| General | Conduct silviculture surveys in support of all strategies. | 1 |
| ***Short Term*** | | |
| | There are no strategies to increase the quantity of timber in the short term. | |
| ***Mid Term*** | | |
| **MT2** | (See "Summary of Information and Research Needs.") | |
| **MT4** | Ensure stands at the beginning of the long term harvest queue (decades 8 & 9) are available by spacing 5 000 ha of dense hemlock/cedar stands over 10 years. | 4 |
| ***Long Term*** | | |

| | | |
|---|---|---|
| **LT1** | Maintain the timber harvesting land base by: | |
| | (a) Treating approximately 200 ha of backlog NSR. | 3 |
| | (b) Maintaining approximately 400 ha of previously reforested backlog plantations. | 2 |
| **LT2** | Survey 1 600 ha of deciduous stands to determine their potential and suitable silviculture treatments. | |
| **LT3** | Increase the volume of regenerated stands by 7% by: | |
| | i) using improved seed as available (currently available for 80% of spruce stock); (increase) | 2 |
| | iii) using larger planting stock on approximately 20% of areas; (increase) | 7 |
| | iv) fertilizing approximately 80% of trees at the time of planting; (increase) [ does not match workshop writeup] | 5 |
| | v) brushing 400 ha/yr for growth enhancement (i.e., not only for survival); (increase) and | 6 |
| | vii) repeat fertilize 450 ha/yr on a 15 yr return cycle. | 8 |
| **LT4** | Continue MT 2 as appropriate. | |

Timber Quality

| No. | Strategy | Priority |
|---|---|---|
| **Q1** | Prune 25 ha/yr to 5.5 m in two lifts (requires a program of 50 ha/yr) to create knot-free timber in the bottom 5.0 m log. | 4 |

## *Silviculture Regimes & Investment Priorities*

The following table indicates incremental silviculture regimes which are suitable to attaining the above working targets and strategies.

| | | | Timber Supply Effects | | | | | | Direct | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Strategy | Opportunity | | | | | | Jobs | Cost | Wkshp |
| Regimes | | Area (Ha/Yr) | Short | Medium | Long | Quality | Habitat | Days/ha | \$/ha[1] | Rank |
| **Surveys** | | 3600 | | | | | | | 25 | 1 |
| **Backlog** | | | | | | | | | | |
| 1 rehab site prep | LT1a | 100 | 0 | 0 | ++ | ++ | + | 1 | 800 | 3 |
| 2 rehab planting | LT1a | 100 | 0 | 0 | ++ | ++ | + | 1 | 400 | 3 |
| 3 brushing (plant + maintenance) | LT1a,b | 400 | 0 | + | ++ | ++ | + | 1.5 | 500 | 2 |
| **Pre FTG**[1] | | | | | | | | | | |
| 4 improved seed | LT1 | 250 | 0 | 0 | +++ | + | 0 | | | 2 |
| 5 large stock | LT3 | 100 | 0 | 0 | + | + | 0 | 0.5 | 400 | 7 |
| 6 fertilize at planting | LT3 | 480 | 0 | 0 | + | + | 0 | 0.1 | 150 | 5 |
| 7 brushing for growth | LT3 | 400 | 0 | 0 | + | + | 0 | 1.5 | 500 | 6 |
| **Post FTG** | | | | | | | | | | |
| 8 space | MT4 | 500 | 0 | ++ | 0 | 0 | +/- | 2.5 | 800 | 4 |
| 9 fertilize (multi fert) | LT3 | 450 | 0 | + | + | 0 | +/- | 0.1 | 250 | 8 |
| 10 Prune (spaced) 1st lift | Q3 | 25 | 0 | 0 | 0 | +++ | +/- | 4 | 800 | 4 |
| 11 Prune (spaced) 2nd lift | Q3 | 25 | 0 | 0 | 0 | +++ | +/- | 4 | 800 | 4 |

[1] FTG - Free to Grow. Pre-FTG activities are not included in the program or jobs table.

### *Incremental Silviculture Program*

The following annualized program will contribute to achieving the above goals and strategies. This program is considerably above historic levels and some activities may require phasing in. However, it does not include activities that may be required for caribou habitat management (pending research results). Spacing and pruning goals represent an anticipated upper bound. Lesser program levels should be oriented to specific target stands as shown in the regime table.

**Program Table - Ha, Revelstoke TSA, March 1999 (not including Pre-FTG activities)**

| Year | Surveys* | Backlog Site Prep | Backlog Planting | Backlog Brushing | Space | Prune | Fertilize |
|---|---|---|---|---|---|---|---|
| 1 | 3,600 | 100 | 100 | 400 | 500 | 50 | 450 |
| 2 | 3,600 | - | 100 | 300 | 500 | 50 | 450 |
| 3 | 3,600 | - | - | 200 | 500 | 50 | 450 |
| 4 | 3,600 | - | - | 200 | 500 | 50 | 450 |
| 5 | 3,600 | - | - | 100 | 500 | 50 | 450 |
| Subtot Yr 1 - 5 | 18,000 | | 200 | 1,200 | 2,500 | 250 | 2,250 |
| 6 - 10 | 18,000 | - | - | 150 | 2,500 | 250 | 2,250 |
| Total Yr 1 - 10 | 36,000 | | 200 | 1,350 | 5,000 | 500 | 4,500 |

* Includes prescription and layout

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unit cost ($/ha) | 25 | 800 | 400 | 500 | 800 | 800 | 250 |

**Program Table - $ 000s, Revelstoke TSA, March 1999 (not including Pre-FTG activities)**

| Year | Surveys* | Backlog Site Prep | Backlog Planting | Backlog Brushing | Space | Prune | Fertilize | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 90 | 80 | 40 | 200 | 400 | 40 | 113 | 963 |
| 2 | 90 | - | 40 | 150 | 400 | 40 | 113 | 833 |
| 3 | 90 | - | - | 100 | 400 | 40 | 113 | 743 |
| 4 | 90 | - | - | 100 | 400 | 40 | 113 | 743 |
| 5 | 90 | - | - | 50 | 400 | 40 | 113 | 693 |
| Subtot Yr 1 - 5 | 450 | 80 | 80 | 600 | 2,000 | 200 | 563 | 3,973 |
| 6 - 10 | 450 | - | - | 75 | 2,000 | 200 | 563 | 3,288 |
| Total Yr 1 - 10 | 900 | 80 | 80 | 675 | 4,000 | 400 | 1,125 | 7,260 |

### Job Creation

The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets. The long term jobs table includes the potential harvest increment associated with caribou habitat management on the basis that either the habitat requirements will prove (through research conducted under this strategy) to be either currently over-stated or if not, to be achievable at younger stand ages through silvicultural treatments.

**Program Job Outcomes, Revelstoke TSA, March 1999 (not including Pre-FTG activities)**

***Short term*** *employment associated with undertaking the silviculture activity, in person years*

| Year | Surveys | Backlog Site Prep | Backlog Planting | Backlog Brushing | Space | Prune | Fertilize | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.80 | 0.50 | 0.50 | 3.00 | 6.25 | 1.00 | 0.23 | 13.28 |
| 2 | 1.80 | - | 0.50 | 2.25 | 6.25 | 1.00 | 0.23 | 12.03 |
| 3 | 1.80 | - | - | 1.50 | 6.25 | 1.00 | 0.23 | 10.78 |
| 4 | 1.80 | - | - | 1.50 | 6.25 | 1.00 | 0.23 | 10.78 |
| 5 | 1.80 | - | - | 0.75 | 6.25 | 1.00 | 0.23 | 10.03 |
| Subtot Yr 1 - 5 | 9.00 | 0.50 | 1.00 | 9.00 | 31.25 | 5.00 | 1.13 | 56.88 |
| 6 - 10 | 9.00 | - | - | 1.13 | 31.25 | 5.00 | 1.13 | 47.50 |
| Total Yr 1 - 10 | 18.00 | 0.50 | 1.00 | 10.13 | 62.50 | 10.00 | 2.25 | 104.38 |

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job (Source Revelstoke TSR2 SEA)

***Long term*** *employment associated with improved quality and quantity of the timber resource*[1]

| Decade | Harvest Increment ('000 m3) | Incremental Jobs per year by decade TSA[2] | Incremental Jobs per year by decade Prov[3] | Incremental Jobs Total by decade TSA[2] | Incremental Jobs Total by decade Prov[3] |
|---|---|---|---|---|---|
| 1 | - | - | - | - | - |
| 2 | - | - | - | - | - |
| 3 | - | - | - | - | - |
| 4 | - | - | - | - | - |
| 5 | 23 | 32 | 65 | 320 | 646 |
| 6 | 44 | 61 | 124 | 612 | 1,236 |
| 7 | 28 | 39 | 79 | 389 | 787 |
| 8 | 28 | 39 | 79 | 389 | 787 |
| 9 | 28 | 39 | 79 | 389 | 787 |
| 10 | 28 | 39 | 79 | 389 | 787 |
| 11 | 28 | 39 | 79 | 389 | 787 |
| 12 | 28 | 39 | 79 | 389 | 787 |
| 13 | 28 | 39 | 79 | 389 | 787 |
| 14 | 28 | 39 | 79 | 389 | 787 |
| 15 | 28 | 39 | 79 | 389 | 787 |
| 16 | 28 | 39 | 79 | 389 | 787 |
| 17 | 28 | 39 | 79 | 389 | 787 |
| 18 | 28 | 39 | 79 | 389 | 787 |
| 19 | 28 | 39 | 79 | 389 | 787 |
| 20 | 28 | 39 | 79 | 389 | 787 |
| 21 | 28 | 39 | 79 | 389 | 787 |
| 22 | 28 | 39 | 79 | 389 | 787 |
| 23 | 28 | 39 | 79 | 389 | 787 |
| 24 | 28 | 39 | 79 | 389 | 787 |
| 25 | 28 | 39 | 79 | 389 | 787 |
| Total | | | | 8,326 | 16,832 |

Notes:

1. Assumes continuation of on the incremental silvicture program beyond the first 10 years, in accordance with the strategy. The total harvest increment is associated with all the silvicultural practices documented in the "Opportunities" section and is only partly attributable to spacing and fertilization practices. Some of the increase may be associated with pre-free growing silviculture that was not current practice at the time of TSR2.

2. Assumes 1.39 TSA level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre (Source: Revelstoke TSR2 SEA Table 13,

3. Assumes 2.81 Province level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre (Source: Revelstoke TSR2 SEA Table

## *Further Research and Information Needs*

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for an incremental silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 15.

Conduct the following research and assessments related to lichen forage production for caribou to determine if silvicultural actions can be beneficial: (MT2)

Research the desired stand characteristics for caribou lichen forage production and determine at what age they occur.

Conduct additional FSSIM modeling and analysis of the medium and high emphasis biodiversity constraints. It is unknown how the imposition of these biodiversity constraints might affect the results of the special caribou run and when the ages at which caribou constraints no longer become limiting.

If research indicates the desired stand characteristics do not occur unaided at desired younger ages (or if ages are older than currently modeled), design and apply silvicultural treatment regimes to create them. The extent of the benefit to the harvest forecast would depend upon the availability of treatable stands and the economics of silvicultural treatments. Conduct field analysis to locate these stands and determine the total opportunity.

TIPSY yields and diameters for older spruce stands require confirmation. (MT2)

Further analysis of suitability and effect of fertilizing young Fdi and Pl stands for the purpose of ensuring these stands are of merchantable size in 80-90 years is needed. (MT4)

A survey of deciduous stands is required to determine their potential and suitable silviculture treatments, if any. (LT2)

Fertilization trials are needed to determine if the fertilizable land base could be expanded to include spruce or hemlock. (LT3)

OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (LT3)

Further study of root rot management techniques and options is needed. (LT5)

Old growth site index estimation studies require completion. It is anticipated that site indexes may be underestimated for Cw and Hw.

# Introduction

## About the Interim Strategy

This strategy, and the process on which it is founded, is intended to help optimize the application of available funding for silviculture activities towards the goals of improving the future quantity and quality of both habitat and timber supply. The strategy will be considered as one of several inputs in decisions on funding allocations and treatment activities.

The limitations of time, budget and available information have tended to cause the focus in this first version of the strategy to be on the future quantity of the timber resource. It is expected that as the strategy development process evolves and as better and more information becomes available, the strategy will have more regard to the matters of future timber quality and the future quantity and quality of habitat supply.

To achieve the optimization objective, the opportunity evaluation process recorded herein is not limited by factors such as the availability of funding, funding source (e.g., public vs. private), or the ability to deliver a program. Because of this, the strategy generally illustrates the plausible high end of the potential of the timber resource. Within this context as well as a broad context of cost-effectiveness, available treatment opportunities, and operational realities -- all of which were explored in general terms in the workshop -- potential treatment activities are ranked. The end result hopefully points to the most effective and efficient means of at least partially achieving the working targets. The degree to which the overall strategy ultimately proves appropriate and is achieved will also be the degree to which the expressed targets will be achieved. This, of course, could also be affected by future unknowns, such as major changes in forest policy, land base available for timber production, or market demand.

Although this strategy focuses primarily on silviculture, it is recognized that silviculture is part of a suite of potential strategies which together may influence the future quality and quantity of habitat and timber supply.

This strategy should not be confused with the allowable annual cut (AAC)[1] determination process. AAC's are based on actual practice and current information at the time of the determination. This strategy, on the other hand, is about creating a future state of our forests. Again, the degree to which the strategy proves appropriate and is achieved may influence future, but not necessarily present, AAC determinations.

This strategy is founded on readily available information and the knowledge of forestry professionals. It is intended as an interim strategy until a more in-depth analysis-based review is completed.

## Methodology

This strategy was prepared through the following process:

1. Prior to the district working session, L. P. Atherton & Associates prepared a preliminary draft of this document, summarizing all available information relevant to a strategy and identifying opportunities to improve the future quantity and quality of timber supply.
2. A district working session was held March 4 & 5, 1998 in Revelstoke, attended by representatives of the organizations and forest companies listed below. Larry Atherton of L. P. Atherton & Associates and Doug Williams of Cortex Consultants Inc. led the session. Participants re-

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[1] See "Abbreviations," page 43 for a full listing of abbreviations used.

viewed the potential opportunities identified in the draft document along with others that arose. The outcome of the session was a regime table, complete with priorities.

3. The consultants incorporated the results of the working session into the draft document and added forecasts of future harvest quantity and quality and of job outcomes.
4. After ministry review, the consultants submitted a completed strategy document to the Ministry of Forests (MoF) in electronic format as version 1.2. (The ministry will assign higher version numbers (e.g., 1.3, 1.4, etc.) as the strategy evolves and changes are made.)

## Acknowledgments

The participation of representatives of the following organizations at the district workshop is gratefully acknowledged.

*Ministry of Forests:*

- Columbia Forest District
- Nelson Forest Region

*Ministry of Environment, Lands & Parks:*

- Habitat Protection Branch

*Forest licensees of the Revelstoke TSA:*

- Downie Street Sawmills
- Bell Pole Company

Representatives of Pope & Talbot Ltd. (TFL 23) also attended as observers and contributed to workshop discussions.

The project was directly managed by Ivan Listar of the Ministry of Forests, Nelson Forest Region. Funding was provided by Forest Renewal BC under a contract between the Ministry of Forests, Victoria (administered by Ralph Winter, Forest Practices Branch) and Cortex Consultants, Inc.

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# Higher Level Goals and Objectives

This section documents higher level goals and objectives relevant to a silviculture strategy for the TSA.

## Provincial Goals

Fundamentally, government's goals can be characterized as:

- sustainable use;
- community stability; and
- a strong forest sector. (MoF, 1998a)

## Provincial Objectives

Until provincial targets for timber quantity and quality are established, management unit strategies are to consider the following interim provincial strategic objectives (MoF, 1998a). Incremental silviculture strategies must also be in keeping with higher level plans under the Forest Practices Code.

**Objective 1:** Maintain current harvest levels as long as possible without creating disruptive shortfalls in future timber supply.

**Objective 2:** Create a long term timber supply capable of supporting a steady long term provincial harvest level similar to current levels.

**Objective 3:** Minimize the interim shortfall in provincial harvest anticipated before a steady long term timber supply is achieved.

**Objective 4:** Create a long term timber supply which will enable the timber quality profile of future harvests to be the same or better than the current profile.

It is recognized that not every management unit has the same capability to contribute to these interim objectives. Further, it is recognized that these objectives may not be attainable at current funding levels. Their purpose is to provide general guidance to the application of available funds.

## Regional Objectives

The region has not set out formal regional incremental silviculture objectives. In the interim, the provincial objectives are accepted as being broadly applicable within the region.

## Higher Level Plans

Formal higher level plans are strategic plans defined by the Forest Practices Code, however, there are currently no approved higher level plans covering the Columbia Forest District. The Kootenay Boundary Land Use Plan has been approved but the decision whether to make it a higher level plan has not been finalized. Until that time it provides guidance for management practices.

There are other plans that exist at a higher level which are strategic (policies and guidelines), or operational that provide direction to any lower level of plans, prescriptions, or forest practices. These, however, are not higher level plans as defined under the Code.

# Basic Data

## Land Area

| Description | Area (ha) | Area % |
|---|---|---|
| Total Area of TSA | 501 500 | 100 |
| Total Productive Crown Forest | 221 500 | 44 |
| Net Timber Harv. Land Base | 67 700 | 13.5 |

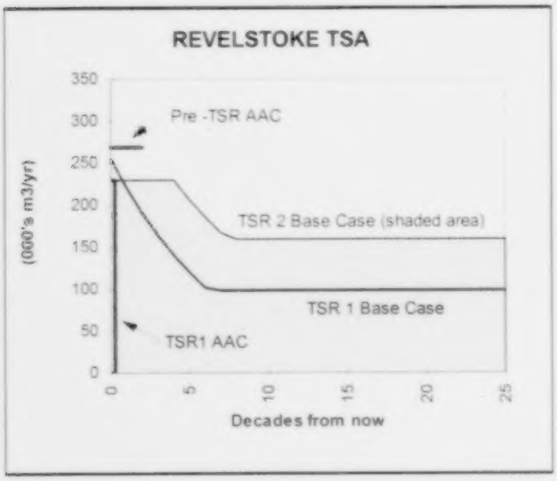
Source: TSR2 analysis report - rounded to nearest 100 ha.
*TSR1 net THLB - 62 700 ha.

## AAC

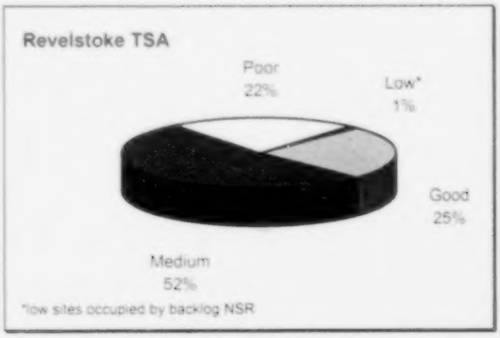
| AAC Type | Pre-TSR | TSR1* | Change (%) |
|---|---|---|---|
| Conventional | 269 000 | 230 000 | -14.5 |
| Deciduous | - | - | |
| Insect/Disease | - | - | |
| Marginal | - | - | |
| Total | 269 000 | 230 000 | -14.5 |
| Woodlot AAC | | | |

*effective January 1/95

## Harvest Forecast

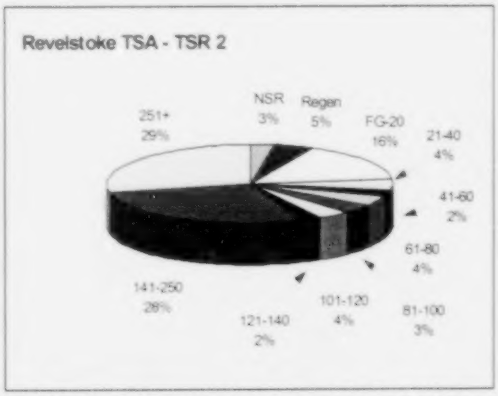


## Site Class



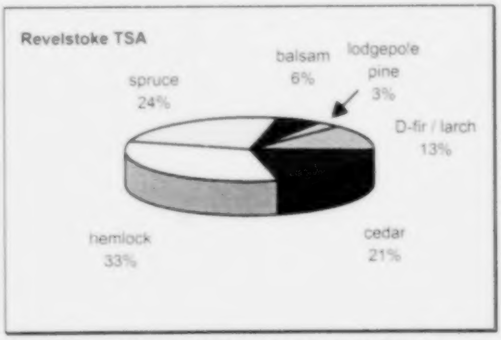
THLB only. Source:TSR2 analysis report - Fig 4.

## Age Class



THLB only. Source:TSR2 analysis report - Fig 5, Table A-19

## Tree Species



THLB only. Source: TSR2 analysis report Fig. 3.

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# Incremental Silviculture History

Approximately 480 ha are harvested annually (TSR2 analysis report, p. 24).

| **Treatment** | **TSR2 Status (1998)** | | **Current Status (1999)** |
|---|---|---|---|
| | **Incorporated in Timber Supply Analysis** | **Not Incorporated in Timber Supply Analysis** | Source: CFD[2] |
| ◆Backlog | All backlog areas (1 800 ha) are considered part of the THLB. Yields are projected for various natural stocking levels. | | Approximately 200 ha are planned for treatment. An additional 400 ha require brushing to ensure free growing is achieved. The remaining backlog areas are not planned for treatment and are expected to regenerate naturally over time. |
| ◆Conversion | None. | | None |
| ◆Commercial Thin | None. | | None |
| ◆Space | TIPSY used for stands regenerated over the past 20 years. Assumes incremental spacing for stocking control on stands harvested prior to 1987 and either basic or incremental spacing thereafter. | | Max recent program of 100 ha/yr. Spacing is not usually required to deal with over stocking. Rather, the problem is the opposite - brushing is needed on most stands to keep stocking levels up. |
| ◆Prune | | | Max recent program of 50 ha/yr. |
| ◆Fertilize | | | None |

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[2] CFD - Columbia Forest District

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# Issues and Silvicultural Opportunities

TSA modelling in support of silviculture planning has not yet been undertaken. In its absence, sensitivity analyses from the TSR2 analysis report are the best source of information as to the opportunities for incremental silviculture to increase future timber supply. A detailed issues and opportunities analysis is contained in Appendix B, page 46.

The following are selected sensitivity analsysis charts from the TSR2 analysis report, to which opportunity information is added to illustrate the opportunities. (Figure 1 was not included in the analysis report.) Further modeling is required to confirm the indicated effects.

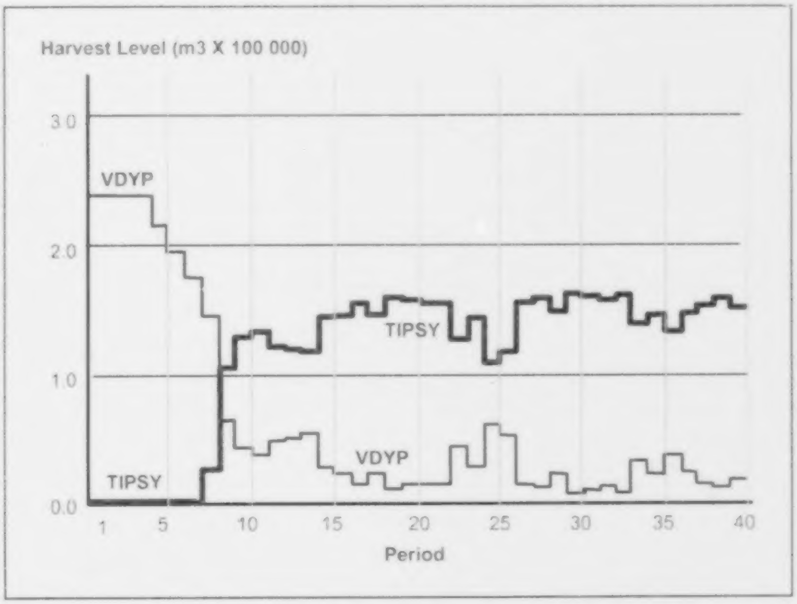

**Figure 1. Harvest Queue of Existing Stands (VDYP) and Managed Stands (TIPSY)**

Decade eight is the earliest the model can draw from managed stands due to minimum harvest age limitations. The major transition from existing to managed stands occurs in decade 9. The harvest forecast is highly sensitive to the availability of these stands as Figure 2 shows.

Unlike most other TSA's, existing stands are utilized throughout the planning horizon, probably because of caribou constraints on harvesting.

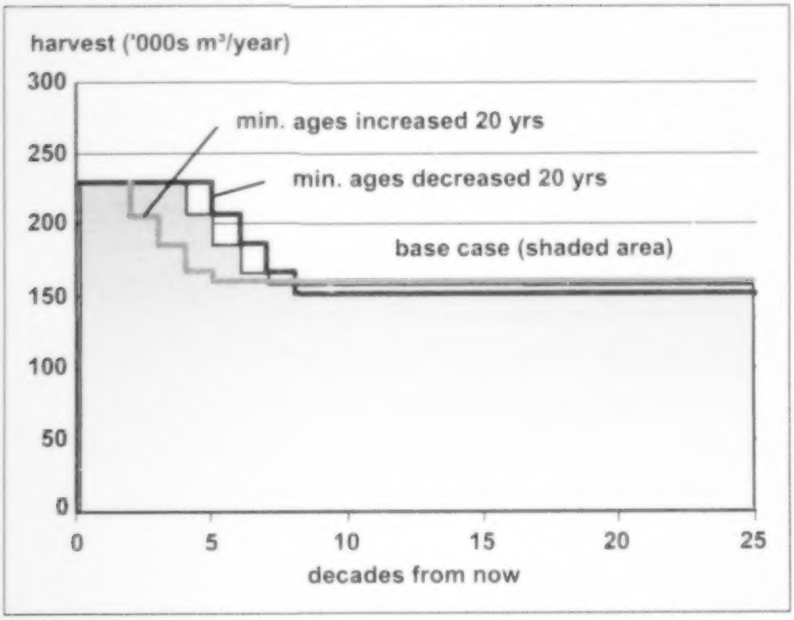

Figure 2. Sensitivity to Changes in Minimum Harvestable Ages and Implications for Timber Quality Management

The sensitivity to a 20 year increase in minimum harvest ages points to the need to ensure that stands in the harvest queue at the point of transition between existing stands and managed stands (80 -90 years from now) have achieved minimum harvestable size and are available. Silvicultural activities such as spacing and fertilization can assist this.

The chart illustrates that growing forests 20 years longer for quality purposes would substantially reduces mid term harvest levels. In the long term, quality and quantity goals are more compatible. Raising minimum ages 20 years for the purpose of improving timber quality has no effect on the LTHL.

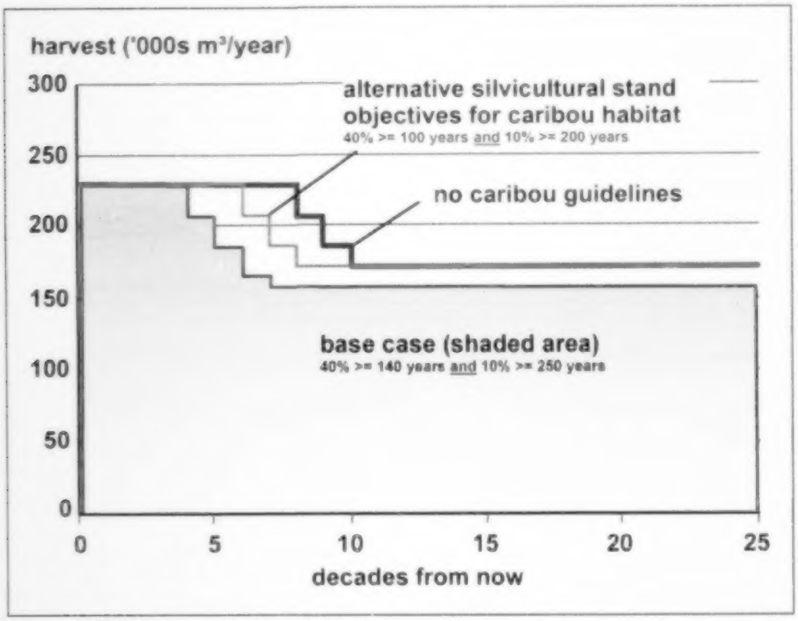

Figure 3. The Effect of Varying Caribou Constraints on the Harvest Forecast

Caribou guidelines significantly constrain the base case harvest forecast. Silvicultural treatments may achieve the desired stand characteristics for the production of lichen feed at younger stand ages than were modeled in the base case. A special FSSIM analysis of alternative stand objectives for caribou illustrates this potential.[3] However, because of the heavy caribou constraints, the mid and old seral biodiversity constraints were not modeled in the normal fashion in the base case. It is unknown how the imposition of normal constraints might affect the results of the special FSSIM caribou run. A better understanding of the desired stand characteristics is needed before silvicultural prescriptions can be prepared.

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[3] Thanks to Hal MacLean, Regional Timber Supply Analyst.

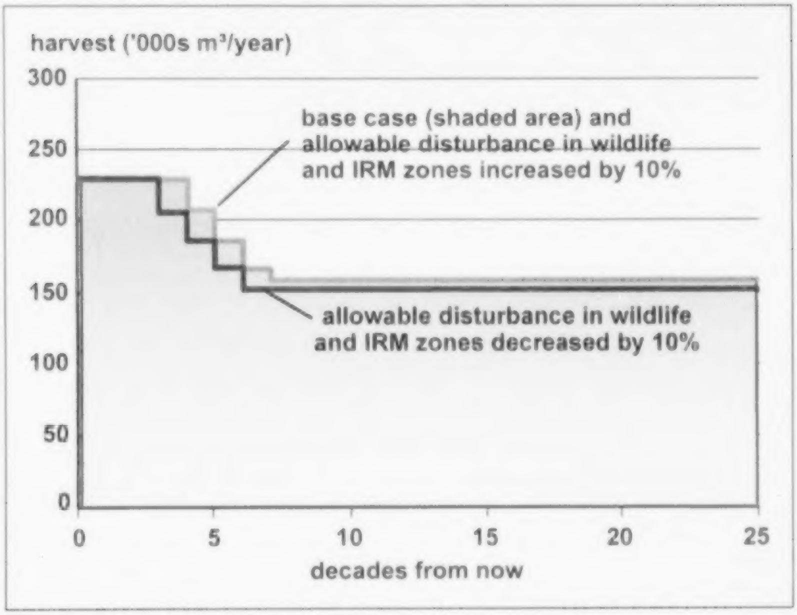

Figure 4. Sensitivity to Changes in Allowable Disturbance Levels in the Wildlife and IRM Zones

The base case is not constrained by forest cover constraints in the wildlife and IRM zones. Increasing the area allowed to be not greened up has no effect. This indicates that silvicultural efforts are better directed at accomplishing caribou habitat requirements at an earlier age (see Figure 3).

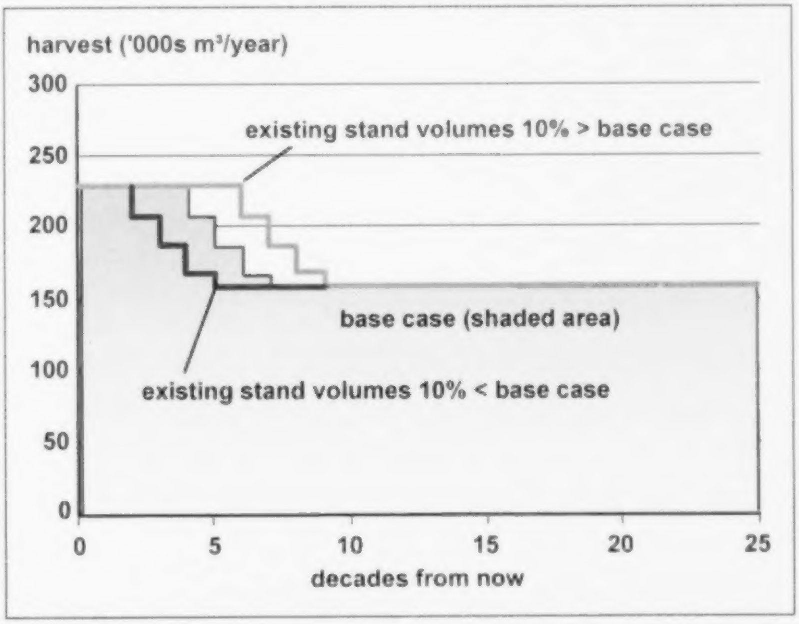

Figure 5. Sensitivity to Changes in Existing Stand Volumes

A recent inventory audit indicates inventory stand volume estimates to be acceptable. Nevertheless there is local concern that cedar/hemlock stand volumes may be overestimated. Should this be the case, the harvest forecast may be lowered as illustrated by the 10% < base case forecast line.

Fertilization has the potential to improve the volumes of some younger existing stands. This may help offset possible lower harvest levels should cedar/hemlock stands prove overestimated. Otherwise, fertilization may help improve the harvest forecast above the base case.

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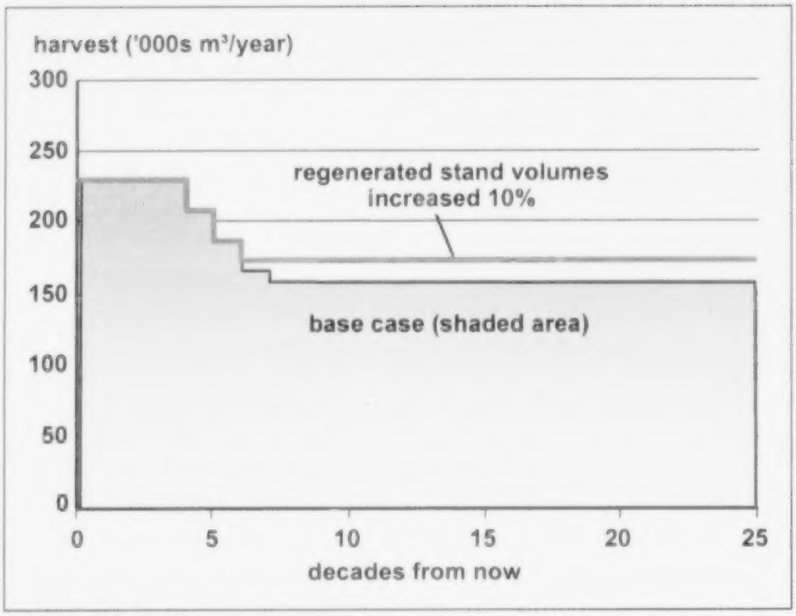

Figure 6. Sensitivity to an Increase in Regenerated Stand Volumes

Increasing regenerated stand volumes by 10% results in a 9% increase in the long term harvest level (LTHL) over the base case. LTHL is also reached one decade sooner. Many silvicultural practices can be used to achieve an increase in regenerated stand volumes.

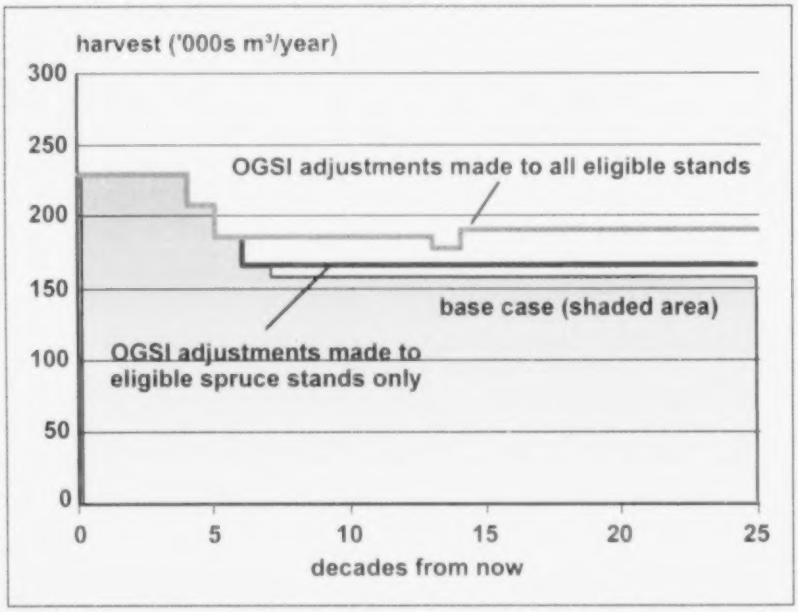

Figure 7. Effects of OGSI Adjustments on the Harvest Forecast

Old Growth Site Index (OGSI) studies have been completed to a statistically valid level for spruce stands (middle line).

When provincial estimates are applied to all eligible stands, a substantial increase in the forecast LTHL results (upper line). LTHL is also reached 2 decades sooner than in the base case. A slight increase in LTHL occurs at the beginning of decade 15, but otherwise the shape of the LTHL does not change. The rise in decade 15 occurs in conjunction with an increasing proportion of managed stands being harvested by the model at this time (see Figure 1).

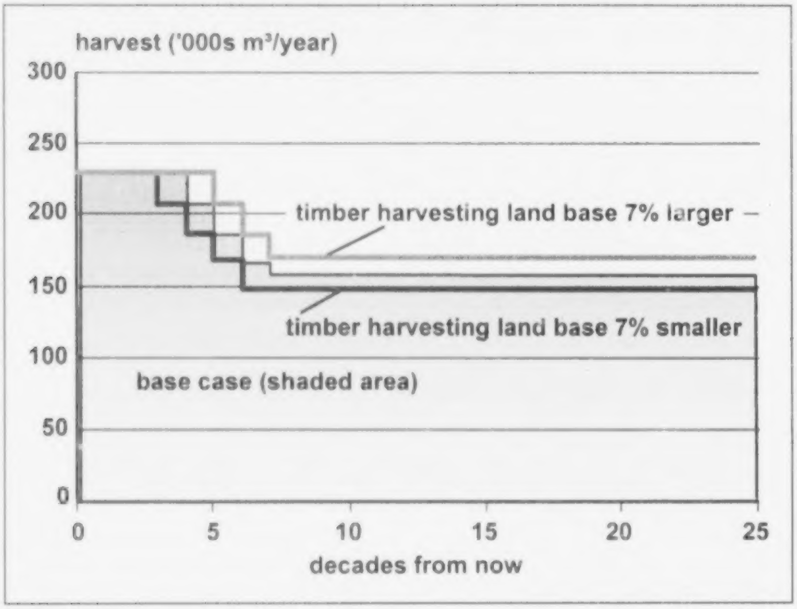

Figure 8. Sensitivity to Changes in the Size of the Timber Harvesting Land Base

Changing the size of the timber harvesting land base affects the timing of the onset of the transition to the LTHL. The LTHL also increases or decreases correspondingly.

Silvicultural practices may be used to enlargen the THLB through activities such as, for example, conversion of non-utilized stands to merchantable species and increasing the productivity of low sites.

## Summary of Issues

### General

The timber supply of the Revelstoke TSA now appears relatively stable. The harvest forecasts and available information paint the picture of a classic "falldown" situation, where harvest levels are systematically reduced over time to reflect the transition from mainly primary to mainly secondary forests. The TSR 2 timber supply is less sensitive to changes in many factors than observed in the TSR1 analysis because there is less pressure on the harvest forecast. The AAC 'ceiling' was lowered from 269 000 (pre-TSR) to 230 000 m3/yr (TSR1) and the LTHL 'floor' was raised from 98 000 (TSR1) to 159 000 m3/yr (TSR2). Also, the TSR2 forecast has better resource information in the base case - for example, VDYP yields for regenerated stands have been replaced with TIPSY yields, an inventory audit has increased confidence in the volume estimates for existing stands, and older forest and other forest practices code requirements are now incorporated.

Due to the abundance of older forests and the relatively small area with very restrictive forest cover constraints (watershed and VQO areas are minor), there are few factors heavily constraining the forecast outside of the forest age profile. The notable exception to this are the caribou habitat requirements for older forest cover which affect 49% of the THLB.

Following from the above, the silvicultural opportunities in the Revelstoke TSA appear to primarily be associated with:

1. increasing the THLB through rehabilitation of problem forest types;
2. maintaining the stocking levels assumed in the base case harvest forecast;

3. spacing and commercially thinning stands to create ungulate winter range and caribou habitat conditions at younger stand ages, thereby freeing up some timber for earlier harvest; and
4. increasing the volumes of regenerated stands.

### Potential for Change in the Shape of the Harvest Forecast

Confirming the shape of the TSR2 harvest forecast is necessary because different silviculture opportunities arise in association with different shapes. There is a degree of uncertainty of the base case, resulting in the need for flexibility regarding implementation of the workshop results as ongoing reviews of issues occur. In choosing and ranking silvicultural strategies, those that will prove valid across the range of possible scenarios, should generally be given a higher priority than those tied into a specific scenario having a degree of uncertainty about it. It should also be recognized that the shape of a harvest forecast can be highly controlled by modeling rules, such that different rules could generate different shapes.

With only one exception, none of the timber supply review sensitivity analysis change shape as a result of varying constraints or information/data. The sole exception is a very mild increase in LTHL above the mid term level that results from a 20% adjustment in productivity to reflect the higher rates indicated by the OGSI project. This higher LTHL could be further enhanced by a possible further 10-15% increase if a goal of increasing regenerated stand volumes by this amount is realized. However, offsetting these future possible increases might be a 6-10% reduction due to modelling the stands outside the THLB without regeneration. When these possible increases and decrease are combined, a mid term harvest shortfall may occur. This is not a result of reductions to the base case, but rather is a result of holding the harvest level constant in this period and raising the harvest level in later decades. Analysis-based work is required to confirm if such a shortfall would be significant. For the purposes of this interim strategy, it is assumed that even if the harvest forecast were to change shape, it will not significantly do so. The underlying age class profile, together with modeling rules would tend to consistently yield a harvest forecast that declines to a steady state level, without a mid term shortfall.

In the district workshop, factors such as operability, spatial distribution of harvest, extent of ESA1 areas and higher TIPSY OAF's were also raised as possible downward influences on the base case, but were not quantified. With the exception of higher TIPSY OAF's these factors, if proven, would likely have a downward influence on the forecast across all time periods. This would tend to move the entire forecast lower, but otherwise not change its shape from that of the base case. Higher TIPSY OAF's would reduce regenerated stand volumes, which if taken from the anticipated increase in these volumes mentioned above, would lessen but not likely eliminate the consequent rise in LTHL.

The age class profile of the TSA suggests any planned silviculture activities will be robust against future change in the TSA land base because there are basically only two age groupings - very young or very old. Future land base reductions are not likely to change the profile because it will either remove old growth, in which case the transition period will commence sooner and the LTHL will be lower because of the smaller future land base; or it will remove second-growth, in which case the LTHL will be lower.

In the absence of better information, the base case harvest forecast is accepted as the benchmark against which the potential outcomes of silvicultural strategies are estimated. (However, the potential harvest forecast contains an adjustment to the base case LTHL to reflect an anticipated site productivity increase.)

### Short Term (1 - 20 years)

The TSR2 base case forecasts harvest levels can be maintained at the current AAC throughout the short term period.

Short term harvest levels are largely governed by the need to extend existing timber supply until regenerated stands become available. Thus factors that affect the existing timber supply greatly affect the ability to maintain the initial harvest level for longer or shorter than in the base case. These are discussed under the Mid Term, below.

There appears to be little opportunity to use silviculture to effect change in the harvests during this transition period, other than perhaps to fertilize suitable stands (if there are any) 10-15 years prior to harvest to give a volume boost.

### Mid Term (21 - 70 years)

The mid term is characterized by a 10%/decade transition from the IHL to the LTHL. In the base case the transition begins at 40 years and ends at 70 years.

Like the short term, the mid term is also largely governed by the need to extend existing timber supply until regenerated stands become available. Factors that affect the existing timber supply greatly affect the ability to maintain the initial harvest level for longer or shorter than in the base case.

Various factors either accelerate or delay the onset of the transition; none change its shape. This indicates that the forest profile holds a greater degree of control over the mid term than do any of the constraints. The sharp transition is probably related to the fact that only 19% of the THLB is currently aged 21-140 years. The model holds the harvest level at the IHL for as long as it can, and then quickly moves through this limited age group (after allowing for the need to hold some stands to satisfy caribou constraints at perhaps much later decades) on to the first available regenerated stands at a steady LTHL. As in the short term, there appears to be little opportunity to use silviculture to effect change in the harvests during this transition period, other than perhaps to fertilize suitable stands (if there are any) 10-15 years prior to harvest to give a volume boost.

The most significant factor affecting the length of time the IHL can be held is the estimate of existing stand volumes. Higher volumes extend IHL, lower volumes shorten it. However, an inventory audit confirms the current estimates as being accurate.

The next most significant factor is the older forest cover requirements for caribou. Sensitivity analysis indicates changes to these can extend IHL up to 4 decades beyond that of the base case. Creating old stand attributes earlier through silviculture may have some potential for increasing mid term harvest. (An additional FSSIM sensitivity analysis conducted while the workshop was in session confirms this - see Figure 3, page 7.) The sensitivity analysis was area-based, while the silvicultural treatments would be age-related.

The transition period begins 2 decades earlier than in the base case if minimum harvest ages are increased 20 years. This is because the base case harvest queue is dependent upon the transition from primary to secondary forests occurring in decades 8 & 9. If these forests are not available until 2 decades later, the existing older forests must be rationed out for 2 more decades to offset this. This is accomplished by commencing the transition period 2 decades sooner.

### Long Term (71 + years)

Modeling methodology may have some implications to formulating a long term strategy. The long term is indicated as sensitive to changes in existing stand volumes, particularly in the test for sensitivity to cedar/hemlock volume estimates. The sensitivity test reflects concerns about the possible effects of decay in these stands.

Continuing on with modeling methodology, the model does not regenerate existing stands outside the THLB. Consequently they are always available to satisfy old forest biodiversity requirements. Increasing ungulate cover requirements 10% lowered LTHL 6%, which may be an indication of the effect to be expected were the TSA required to meet more older forest requirements from within the THLB. In the Golden TSA analysis, the modeling methodology was reported to result in a 10% overestimate in LTHL.

Beyond the above methodological factors, the most significant long term factors are site productivity, regenerated stand volumes and older forest cover constraints.

It is likely that the site productivity of older stands may be underestimated. Sensitivity analysis indicates LTHL could rise 21% above the base case if site indices are underestimated.

As is the case in virtually all management units, the long term is sensitive to changes in regenerated stand volumes. A 10% increase or decrease in volume results in a corresponding approximate 9% increase or decrease to LTHL.

Older forest cover constraints were discussed above under the Mid Term.

### Future

The only significant unknowns indicated by the TSR2 analysis report appear to be site productivity estimates and the level of decay in cedar-hemlock stands. Other significant unknowns (or uncertainties) raised in the workshop and post-workshop are the size of the timber harvesting land base, the effects of explicitly spatial (real) harvest and biological attribute planning and implementation in the TSA, whether certain guidelines for non-timber resources are appropriate to fulfill the objectives behind the guidelines, and problems relating to inventory volumes versus scaled volumes.

### ♦ Future Timber Quality

To date there has been little attention to the matter of future timber quality. The focus of the Timber Supply Review on AAC determination has resulted in the planning emphasis being solely on timber quantity. Until recently, there has been little higher-level policy guidance with respect to managing for future timber quality.

Using age as a surrogate measure of timber quality, the projected decline in harvest ages towards minimum ages indicates future timber quality will be generally be lower than today's. The future timber supply will be much smaller in average diameter and, without pruning, there will be little, if any, clear wood. On the positive side, most harvested second growth timber will be sound wood with little or no decay.

The very high old forest constraints for caribou habitat result in a significant area being held in older stands. A side benefit of this is increased timber quality in these older stands, provided they can be harvested prior to high levels of decay setting in.

Lower quality stands present some future market risk. In low market periods it is often only the readily accessible, higher-quality timber that is profitable to harvest. Also, a narrow portfolio of small diameter timber offers less opportunity for creating a range of value-added forest products.

# Opportunities to Increase Timber Supply

## Potential Silviculture Strategies

Prior to the district workshop, information in the previous sections was used to identify the following silvicultural strategies as having potential to either maintain or increase future timber supply at the TSA level. Each of these was discussed in detail in the district workshop, the results of which are recorded in "Workshop Review of Potential Strategies," page 15, along with additional strategies that arose during the meeting. Strategies that are ultimately adopted are noted in "Silviculture Strategies," page 35.

- **Short Term (1 - 20 yrs)**

ST 1: Fertilize all suitable stands scheduled for harvest in the 2nd decade to increase their volumes. (increase)[4]

ST 2:

- **Mid Term (21 - 70 yrs)**

MT 1: Repeat fertilize all suitable existing stands scheduled for harvest 20 to 70 years from now to increase their volumes. (increase)

MT 2: Commercially thin stands to create old-seral attributes earlier. (increase)

MT 3:

MT 4:

- **Long Term (71+ yrs)**

LT 1: Maintain the THLB by maintaining ____ ha of existing backlog plantations;

LT 2: Increase the THLB by:

a) converting/rehabilitating deciduous stands; (increase)

b) converting/rehabilitating non-merchantable hemlock and cedar stands; (increase)

c) improve the site productivity of low-site stands by (fertilization?). (increase/maintain)

LT 3: Increase regenerated stand volumes by:

i) using improved seed; (increase)

ii) managing stocking so voids do not account for more than 10% of the area; (increase)

iii) using larger planting stock; (increase)

iv) fertilizing at the time of planting; (increase)

v) brushing for growth enhancement (i.e., not only for survival); (increase)

---

[4] (Increase) means oriented to increasing harvest levels above those indicated by the TSR2 base case. (Maintain) means oriented to maintaining the harvest level indicated by the TSR 2 base case.

vi) spacing stands; (maintain) and

vii) repeat fertilize suitable stands on a 15 yr return cycle.

LT 4: Continue MT 2. (maintain/increase)

LT 5: Reduce losses to root rot? (maintain)

LT 6: Plant areas outside of the THLB to increase the area in an old-seral state in 100 to 200 years. (maintain)

LT 7:

## Workshop Review of Potential Strategies

Explanatory notes with respect to the following tables.

| Column Number | Note |
|---|---|
| 1 | The response time frame is the period in which the anticipated result is expected, not the period in which actions must necessarily commence. |
| 2 | Strategy numbers correspond with the numbers recorded earlier in "Potential Silviculture Strategies," page 14. Items followed by an asterisk (*) were added during the district working session. |
| 3 | Information is largely from a meeting of MoF and MoELP personnel and forest licensees held March 4 & 5, 1999 in Revelstoke (the "district workshop") combined with information presented earlier in this document. |
| 4 | Anticipated results are typically calculated using the timber supply response indicated by TSR2 sensitivity analyses. |
| 5 | The harvest forecast for each period uses the TSR2 base case as the starting level. The harvest forecast column was not thoroughly reviewed during the district meeting. *Results are largely conjecture and are meant to illustrate the potential of the strategies.* |

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- **Short Term (1 - 20 years)**

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ ST 1 | 1. Fertilize all suitable stands scheduled for harvest in the 2nd decade. (increase) | 1. Stands scheduled for harvest in this time period are not fertilizable due to their old age. | 2. N/A |
| ◆ | **Short Term Harvest Forecast Summary** | **(000s m3/yr)**<br>230 1st decade<br>230 2nd decade<br>0 fertization<br>230 total | |

- **Mid Term (21 - 70 years)**

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ MT 1 | 1. Repeat fertilize all suitable existing stands scheduled for harvest 20 to 70 years from now. | 1. Effectively, this strategy is a continuation of ST 1. Stands in the early part of this time period, like in the short term, are generally too old to fertilize. Stands that are not too old probably have too high a crown closure to be suitable for fertilization.<br>Stands scheduled for harvest in 50 to 70 years are likely those currently aged 21 - 140 yrs, but this is difficult to tell without better information. Some of these stands may be needed for later harvest in order to meet caribou older forest constraints. There are few stands currently aged 21 - 140 yrs (19% of THLB) because until recently most logging in the general area was in the TFL's and most older TSA logging is now under hydro resevoir.<br>Stands to be harvested 50 years from now would be fertilizable approx. 35 years from now. Those in the ICH zone may need spacing to prepare the density for fertilization. This would mean carrying the spacing cost for much of the rotation. For the purpose of fertilization alone, this carrying cost would be too great. Would require some other benefit to spacing to make it viable. | 1. There is limited potential to raise harvests in this time period. Consider for stand level effects. See LT 3 vii for discussion of fert potential in the long term. |

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ♦ MT 2 | 2. Commercially thin stands to create old seral attributes in:<br>(a) caribou winter range (maintain/increase); and | 2. Old seral stage is critical. Due to modeling methodology, the contribution of areas outside the THLB to meeting requirements was possibly overstated. However, workshop participants felt that, unlike the Golden TSA, both caribou and biodiversity requirements could be met from within the THLB without further impact to the LTHL.<br>(a) The caribou requirements are particularly constraining. The caribou winter range zone occupies 21 900 ha of the ICH and 11 100 ha of the engelmann spruce-subalpine fir (ESSF) zones (49% of THLB). The current requirement is 40% of these areas must be in stands ≥ 140 years old and 10% ≥ 250 years.<br>**Research is required to determine the ages and stand structures necessary for the growth of lichen feed for caribou** (noted under "Summary of Information and Research Needs," page 41). It is possible that the requirements are overstated in the base case due to a lack of better information, and that better information can lead to simply changing the constraints without having to undertake silvicultural treatments.<br>A special FSSIM run was done to analyze the sensitivity of the harvest forecast to lower ages for caribou requirements (Figure 3, page 7). The lower constraints were 10% > 200 yrs of age (vs 250 yrs) and 40% > 100 yrs of age (vs 140 yrs). The results indicated the current IHL could be maintained 2 decades longer than the base case (6 *vs* 4). At lower ages, caribou constraints were no longer limiting in the long term, with LTHL rising above the base case to essentially the same level as the sensitivity test where caribou constraints were removed entirely. However, because of the heavy caribou constraints in the base case, the medium and high emphasis biodiversity constraints were not modeled in the normal fashion in the base case. It is unknown how the imposition of these biodiversity constraints might affect the results of the special FSSIM caribou run. **Additional modeling and analysis is required** (noted under "Summary of Information and Research Needs," page 41).<br>Meeting the lower age requirements means that the caribou zone must at all times have 3 300 ha (10% of the 33 000 ha in the zone) and 13 200 ha (40% of the 33 000 ha) in stands aged ≥ 150 and 100 years respectively. Allocating this on the basis of zone %'s means the ESSF zone must have roughly 1/3 of this, or 1 100 and 4 400 ha in stands aged ≥ 150 and 100 years respectively (total 5 500). The ICH must have the remainder, or 2 200 and 8 800 respectively (total 11 000). Because these are the minimum requirements, the entire zone would have to be under silvicultural management in order to have sufficient stands under recruitment to replace those stands older than the age requirements as they are harvested. Because this cannot occur, some older stands must be held for a considerable time in this state, substantially reducing their MAI.<br>Of the 33 000 ha in the zone possibly just under half, or 15 000 ha, is estimated to be | 2. Extend IHL through decades 4-6. |

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| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| | | available for silvicultural management. Splitting this evenly between the ESSF and ICH zones allots 7500 ha for management in each. Because commercial thinning in the ESSF may be a difficult proposition, the ESSF allotment is further reduced to a management area of 4 000 ha. These areas (4 000 in the ESSF and 7 500 in the ICH) are less than the required areas noted above (6 600 and 11 000 ha). Were the option of silvicultural management of stands for caribou habitat to be pursued, field assessments would be required to determine the extent and location of candidate stands. **Again, additional modeling and analysis is required**.<br>The workshop explored how a regime of silvicultural treatments in the ESSF zone might be used to create old-growth tree attributes at earlier ages, thereby relieving some constraints. Target objectives were to lower the base case constraint ages from 250 and 140 years to 150 and 100 years respectively. Commercial thinning at ages 100 and 80 respectively was assumed to be appropriate to creating stand conditions of the desired vertical structure plus open enough so lichen can become established. This would allow 50 years for lichen development in the target 150 year old stands and 20 years for development in the 100 year old stands.<br>A crown closure of 80% post CT was determined suitable for achieving the desired stand structure. For simplicity, for both the 150 and 100 year old stand age groups a post CT stocking density of 500 stems/ha was established as the target. Using TIPSY, a pre CT density of 800 stems/ha was determined to get this residual density, as well as have a 150 m3/ha minimum volume removal in order to create a profitable CT operation. A minimum pre-CT volume of 300 m3/ha and avg dbh of 30 cm was felt necessary to create a profitable or break-even harvest opportunity. TIPSY indicated that for SI 18, standard OAFs, S stands planted to 1 500 st/ha would have an avg dbh of 26 cm, 933 sph and 411 m3/ha at age 100, and an avg dbh of 24 cm, 1065 sph and 315 m3/ha at age 80. (SI 18 may be high but somewhat reflects the fact that CT is more likely on the higher productivity sites. Higher sites is also reflected to some extent in the netdown of area from 7500 to 4400 ha.) Stand volume and stocking would therefore be adequate, but average diameters would be lower than desired. Achieving the desired pre-CT stocking levels would require managing stands to meet target stocking standards at free growing. Minimum stocking standards would be too low. Spacing would not likely be necessary because under-stocking rather than over-stocking is the usual problem in the ESSF. However, stands should be monitored for ingrowth to be certain they do not become overstocked and consequently of too low average diameter to be commercially thinned.<br>A TIPSY analysis also showed no increase in spruce stand volumes between ages 150 and 250. Also, although average diameters were greater in 250 year old stands, there were few stems over 60 cm dbh. This did not match local field experience and could | |

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| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
|  |  | be a result of TIPSY data limitations. **This should be checked** (noted under "Summary of Information and Research Needs," page 41). It may partially explain why the Revelstoke TSA LTHL is 28% below the long run sustained yield (LRSY). Normally LTHL is only about 10% lower.<br>To summarize:<br>• Research is required to determine the desired stand characteristics for caribou lichen forage production and if they occur at younger ages than currently modeled.<br>• Further FSSIM modeling is required to determine the effect of landscape level biodiversity requirements and the ages at which caribou constraints no longer become limiting.<br>• If research indicates the desired stand characteristics do not occur unaided at the desired younger ages, silvicultural treatments can be applied to create them. The extent of the benefit to the harvest forecast would depend upon the availability of treatable stands and the efficacy and economics of silvicultural treatments. Field analysis would be needed to locate these stands and determine the total opportunity.<br>• In the ESSF, if it is assumed that CT will be necessary to creating the desired stand characteristics (this may not be the case - brush competition may result in lower stocking and create more open stand characteristics), preliminary analysis indicates a regime of planting 1 500 sph, managing for target densities (1 200 sph) at free growing, and spacing only if there is significant ingrowth would yield the necessary stand characteristics for CT at target ages 80 and 100 years. |  |
| ◆ MT 2 | (b) ungulate winter range. (maintain/increase) | (b) Sensitivity tests indicate much lower sensitivity to changes in ungulate winter range requirements than to caribou requirements. Consequently, the workshop focused on managing caribou habitat requirements. | (b) N/A. |
| ◆ MT 3 | 3. Bring forward volumes from the long term. *[5] | 3. At the start of the workshop there was some indication of a possible rise in LTHL creating a mid term shortfall. This potential strategy was therefore added to the list for later consideration. By the completion of the workshop, however, a mid term shortfall, if any, appeared to be minimal. | 3. N/A |

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[5] * - indicates added during the district working session.

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| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ MT 4 | 4. Ensure stands at the beginning of the long term harvest queue (decades 8 & 9) are available.* | 4. Decades 8 & 9 are part of the long term according to the time period definitions adopted for this strategy. However, if the first stands in the long term harvest queue are not merchantable, mid term harvest levels are affected. This is indicated by the sensitivity to an increase in minimum harvest ages. Thus it is important to ensure that the first of the managed stands in the harvest queue are of sufficient size and volume to be merchantable.<br>The first of the managed stands are now 10-20 years old. In 80 years these will be 100 years old. TIPSY analysis conducted in the workshop indicates that these stands can be expected to be merchantable by the time they are needed and that silvicultural treatments are therefore not generally required. However, there are approximately 8-10 000 ha of dense hemlock/cedar stands in this age group. If half of these stands were spaced over a 10 year period, a **spacing program of 500 ha/yr** would ensure these stands reach merchantable size in time.<br>Young Fdi and Pl stands could also be fertilized for the purposes of this objective if necessary. Further analysis of this is required (noted under "Summary of Information and Research Needs," page 41). | |
| ◆ | **Mid Term Harvest Forecast Summary** | Decades 3-4 maintained at IHL of 230 000 m3/yr (base case). Decades 5-6 increased to IHL though either reduced caribou requirements due to better info or management of caribou habitat. | |

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- **Long Term (71+ years)**

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td>◆ LT 1</td><td>1. Maintain the THLB by<br>(a) Treating approx. 200 ha of backlog NSR; (maintain) and<br>(b) maintaining approx. 400 ha of previously reforested backlog plantations.* (maintain)</td><td>1. (a) Most of the remaining backlog NSR is uneconomic to treat. The 200 treatable ha requires the program shown below to achieve free growing.<br>(b) About 400 ha of previously reforested area requires brushing to ensure free growing is achieved. The program shown below is required.
<table>
<tr><th></th><th colspan="5">Area (ha)</th></tr>
<tr><th></th><th></th><th></th><th colspan="2">Brush</th><th></th></tr>
<tr><th>Year</th><th>Site Prep</th><th>Plant</th><th>New</th><th>Existing</th><th>Total</th></tr>
<tr><td>1</td><td>100</td><td>100</td><td>0</td><td>400</td><td>400</td></tr>
<tr><td>2</td><td></td><td>100</td><td>0</td><td>300</td><td>300</td></tr>
<tr><td>3</td><td></td><td></td><td>100</td><td>100</td><td>200</td></tr>
<tr><td>4</td><td></td><td></td><td>100</td><td>100</td><td>200</td></tr>
<tr><td>5</td><td></td><td></td><td>100</td><td>0</td><td>100</td></tr>
<tr><td>6-10</td><td></td><td></td><td>150</td><td></td><td>150</td></tr>
</table>
</td><td>1. (a) (b) Maintain base case LTHL. Area requiring treatment totals 600 ha ≅ 1% of THLB. Failure to treat would result in a 1% drop in LTHL.</td></tr>
<tr><td>◆ LT 2</td><td>2. Increase the THLB by:<br>(a) converting /rehabilitating deciduous stands; (increase)</td><td>2.
<table>
<tr><th></th><th>Area (ha)</th><th>%tot area</th><th>%prod area</th><th>%THLB</th></tr>
<tr><td>(a) Decid</td><td>1 600</td><td></td><td></td><td>2</td></tr>
<tr><td>(b) Non-merch</td><td>4 900</td><td></td><td></td><td>7</td></tr>
<tr><td>(c) Low site</td><td>1 200</td><td></td><td></td><td>2</td></tr>
</table>
(a) Decid. Most decid is birch. The condition of these stands is not known. Some stands may be harvestable, some may be suitable for conifer release, some may be best allocated to meeting wildlife habitat objectives, while others may be suited to continuous deciduous management. **A survey of these stands is required** to determine their potential and suitable silviculture treatments.</td><td>2. Summary. Little potential identified. Survey of decid stands required.</td></tr>
<tr><td>◆ LT 2</td><td>(b) converting/rehabilitating non-merchantable hemlock and cedar stands; (increase)</td><td>(b) Non-merch. These stands are mostly highly decadent age class 8/9 hemlock with 50% + decay and are spread out throughout the TSA. Although they equal 7% of the THLB there are two reasons for not treating them immediately: (1) some may prove merchantable in periods of high pulp prices, and (2) if caribou old-growth constraints</td><td></td></tr>
</table>

Draft

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| | | are at their limits, other stands of better species and productivity would have to be immediately set aside to replace them upon rehabilitation. The consensus of workshop participants was to keep these stands on the shelf for future rehab potential, at which time rehab would start in those landscape units having an old growth surplus. | |
| ◆ LT 2 | (c) improve the site productivity of low-site stands by (fertilization?). (increase/maintain) | (c) Low site. There is no potential for silvicultural treatments to increase the productivity of these stands. | |
| ◆ LT 3 | 3. Increase the volume of regenerated stands by 20% over those used at the base case by:<br>i) using improved seed; (increase) | 3. (i) 100% of areas are planted. About 80% of S is genetically improved stock. No improved stock is planned for the other major species. Latest estimates of yield gains are (%):[6]<br>Species / Cur % / Future % / % gain<br>Hw / 35 / 25 /<br>S / 25 / 35 / 22<br>Cw / 20 / 20 /<br>Fdi(L) / 10 / 10 /<br>Ba / 5 / 5 /<br>Pl / 5 / 5 /<br>Based on S alone, LTHL can be expected to rise 6-7% (80%-100% of S X 35% of area X 20% gain). If Hw and Cw added to S, a 16% rise could occur (80% of area X 20% gain). Yield gains were not included in TSR 2.<br>Tree improvement could significantly reduce green-up & minimum harvest ages. Expanding the tree improvement program to include Hw & Cw would likely offer similar gains to that of S and should be a high priority. **Opportunity area (including S, Hw & Cw) =.8 X 480 = 380 ha/yr.** | 3. (i) 7% - 21% gain possible. See "Summary" below. |
| ◆ LT 3 | ii) managing stocking so voids do not account for more than 10% of the area; (increase) | (ii) TIPSY standard OAF1 factor for voids is 15%. Objective is to reduce this to 10%. Current free growing requirements will result in < 15% in voids, however the actual amount is unknown. Only 13.5% of the total land area of the Revelstoke TSA is within the THLB. This implies more rugged terrain, so an OAF1 of 15% may be reasonable. There is a need for completion of surveys for voids to get a measure of the actual area in voids (noted under "Summary of Information and Research Needs," page 41). Voids can be desirable for wildlife habitat, so intensive void management may not be practicable on all areas. | 3. (ii) No gain likely. See "Summary" below. |

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[6] Source: Ivan Listar.

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ LT 3 | iii) using larger planting stock; (increase) | (iii) Pre free-growing item, although as considered here could be incremental to achieving free growing. Larger stock could be used but not likely in current economic conditions. **Upper bound of opportunity area is the annual area planted = 480 ha/yr**.<br>Mostly now plant 1+0 415b stock which is about 25cm tall. Larger stock would be 1+0 415d which is about 30 cm tall and has a larger caliper. Increased cost for larger stock may be (1500 trees/ha X $.20/tree =) $300/ha. If larger stock used on all sites increased cost would be 480 ha/yr X $300/ha = $144,000/yr.<br>The free growing period is 10-12 years. Pure speculation, but if larger stock reduces age to FG by 2 yrs, could also reduce time to a specified technical rotation size by 2 yrs. Assuming technical rotation size is equal to size at culmination and this age is 100, MAI is increased by 2% when the same size is reached at age 98. A 2% MAI increase translates to a 2% LTHL increase. | 3. (iii) Possible 2% gain in LTHL. See "Summary" below. |
| ◆ LT 3 | iv) fertilizing at the time of planting; (increase) | (iv) Pre free-growing item, although as considered here could be incremental to achieving free growing. Not presently eligible for FRBC funding and not likely to be voluntarily undertaken unless necessary to achieve FG.<br>Bell Pole has been fertilizing at time of planting in the Mica area. Early results look promising. Goal is to eliminate one brushing treatment as well as reach free growing one year earlier. Cost is currently in the $150/ha range (vs. $450/ha for brushing) but may come down with more experience. Also, some nurseries are looking at adding formulations to the rooting medium.<br>Bell Pole estimates free growing may be achieved 1 year earlier in the ESSF zone in response to fertilizing at planting (12 yrs vs 13 for 2m ht). Estimates are not available for the ICH zone. Estimated gain in LTHL is therefore < 1% (see LT 3 iii for logic in determining LTHL gain).<br>**Opportunity area assumed to be 100% of areas planted. Opportunity cost =($150 X 480 =) $72,000/yr.**<br>Note: Post workshop follow-up by Ivan Listar of the MoF indicates that results elsewhere are inconclusive. One trial found a general favourable response, but also that certain formulations and certain species had a negative response. Fertilization did not prevent a brushing on brush sites. | 3. (iv) Less than 1%. See "Summary" below. |

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| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
| ◆ LT 3 | v) brushing for growth enhancement (i.e., not only for survival); (increase) | (v) Pre free-growing item, although as considered here could be incremental to achieving free growing. Not presently eligible for FRBC funding and not likely to be voluntarily undertaken unless necessary to achieve FG.<br>About 80% of harvested areas or (.8 X 480 = ) 400 ha currently being brushed for survival. Because every ha needs approx. 2.5 brushing treatments this equals an annual program of 1 000 ha/yr.<br>Brushing treatments typically are done until trees reach 1 m in ht. After this they are expected to survive to free growing at 2m, but growth is impeded. If 1m ht reached in 6 yrs, it then takes 4-5 yrs to reach 2m. An additional brushing may shorten this by 1 year.<br>**Potential for 400 add'l ha of brushing** for growth at a total cost of $140,000/yr (@$350/ha). Resultant gain in LTHL would be < 1%. | 3. (v) Less than 1%. See "Summary" below. |
| ◆ LT 3 | vi) spacing stands; (maintain) and | (vi) Virtually no basic and little incremental spacing is necessary. In fact, due to heavy brush competition, the opposite problem - that of too few stems - tends to be the problem. | 3. (vi) N/A. See "Summary" below. |
| ◆ LT 3 | vii)repeat fertilize suitable stands on a 15 yr return cycle. | (vii) See LT 3 (i) for future species profile.<br>On a long term steady state basis, 15% of the species (Fdi & Pl) on 60% of the site classes could be suitable for a multiple fertilization regime. This equates to (.15 X .6 = ) 10% of the THLB or 6 700 ha. **On a 15 yr return cycle, this requires a program of (6 700/15 = ) 450 ha/yr**. A 10% volume gain would increase long term harvest levels (0.1 X 0.1 =) 1%.<br>Much of the above fertilizable land base is in valley bottoms where most of the harvest constraints are. Workshop participants felt there was some risk to fertilizing these stands and then not being able to harvest them either at the optimum time or at all.<br>There is little experience in fertilizing spruce or hemlock. Given that these are major species components of the THLB, fertilization trials are needed to determine if the fertilizable land base could be expanded to include these species (noted under "Summary of Information and Research Needs," page 41). | 3. (vii) Possible 1% gain to LTHL. See "Summary" below. |

<table>
<tr><th>Number</th><th>Potential Strategy/Action</th><th>Discussion / Current Status</th><th>Anticipated Result</th></tr>
<tr><td>◆ LT 3</td><td>3. Summary</td><td>3. Summary
<table>
<tr><th>Item</th><th>% Gain (low end)</th><th>% Gain (high end)</th></tr>
<tr><td>Seed</td><td>6</td><td>16</td></tr>
<tr><td>Voids</td><td>0</td><td>0</td></tr>
<tr><td>Lg stock</td><td>1</td><td>2</td></tr>
<tr><td>Fert at plant</td><td>0</td><td>1</td></tr>
<tr><td>Brush</td><td>0</td><td>1</td></tr>
<tr><td>Spacing</td><td>0</td><td>0</td></tr>
<tr><td>Repeat fert.</td><td>0</td><td>1</td></tr>
<tr><td>Total</td><td>7</td><td>21</td></tr>
</table></td><td>3. Summary<br>Sensitivity analysis indicates a 10% increase in regen vol's results in a 9% increase in long term harvest levels. A 7-21% gain would therefore yield a ⇒ 6-19% increase in LTHL. Assume 6% potential for now.<br>Increased site productivity may compound these effects.</td></tr>
<tr><td>◆ LT 4</td><td>4. Continue MT 2.</td><td>4. See MT 2 above.</td><td>4. See MT 2 above.</td></tr>
<tr><td>◆ LT 5</td><td>5. Reduce losses to root rot by: (maintain)<br>(a) planting alternate species;<br>(b) pop-up spacing;<br>(c) pushover logging / stumping; and<br>(d) mixed species planting.</td><td>5. The smaller THLB makes the consequences of a severe pest attack more serious in this TSA.<br>Due to limited time availability in the workshop, root rot management activities were not individually reviewed. Activities (a), (c) and (d) will occur through basic silviculture where necessary.<br>Root rot is endemic mostly in Fdi and Ba stands (15% of THLB). If 20% of these stands are severely infected and infection results in a 20% growth reduction, net effect is (.15 X .2 X .2 =) <1%. This is likely already allowed for by the 5% OAF 2 reduction applied to TIPSY yields.<br>The need for further study of root rot management noted under "Summary of Information and Research Needs," page 41.</td><td>5. N/A</td></tr>
<tr><td>◆ LT 6</td><td>6. Plant areas outside of the THLB to increase the area in an old-seral state in 100 to 200 years. (maintain)</td><td>6. This opportunity was not discussed during the district workshop. Not likely to be practiced in the foreseeable future.</td><td>6. N/A.</td></tr>
</table>

| Number | Potential Strategy/Action | Discussion / Current Status | Anticipated Result |
|---|---|---|---|
|  | Long Term Harvest Forecast Summary | (000s m3/yr)<br>159 base case<br>32 site productivity (20%)<br>191 adjusted base<br><br>0 increase THLB<br>13 increase regenerated stand volumes (7%)<br>15 ungulate (8%)<br>0 root rot<br>0 plant outside THLB<br>219 total |  |

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## Potential Harvest Forecast

Figure 9 graphs the potential harvest level that may be attained through implementation of the silvicultural strategies in the preceding tables. This forecast is highly speculative and requires confirmation through computer-based modeling and analysis. It also includes silvicultural activities that are not within the traditional scope of incremental silviculture. Modeling may indicate more precise timing, targeting and program levels associated with incremental silviculture activities than could be developed in this interim strategy.

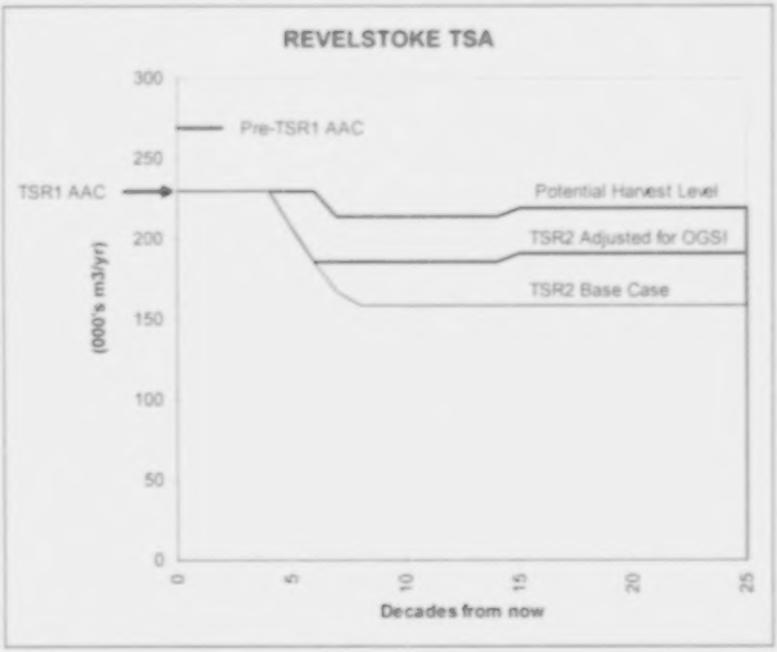


**Figure 9. Potential harvest forecast, Revelstoke TSA**

In the strategy workshop, some uncertainties regarding the base case were mentioned. At the time this strategy was prepared, the chief forester had not yet made the TSR2 AAC determination, so it was not known how he will view the base case forecast. Figure 9 contains only an adjustment for increased site productivity which appears fairly certain (OGSI line). Other, potentially negative influences may exist but are not accounted for here. The difference between the two higher forecasts illustrates the potential outcome of the strategy. This difference would likely remain the same regardless of any base case amendment. The potential harvest level primarily results from improved caribou habitat management and increased regenerated stand volumes.

# *Opportunities to Improve Timber Quality*

The effects of incremental silviculture on the future quality of the timber resource is not analyzed in the timber supply review. Information in this section was gathered during the district working session.

## Product Objectives

The following are product objectives at the log level for the Revelstoke TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log**: | S | 45+ cm minimum average stand diameter at breast height (DBH), some clear wood component. |
| | Hw, Cw | 35+ cm minimum average stand DBH, some clear wood component. |
| **Sawlog**: | All | 25+ cm minimum average stand DBH. |

## Potential Strategies by Response Time Frame

The following strategies have potential to increase timber quality. These were identified in the district working session, except the large log calculation was performed later. The response time frame is the period in which the anticipated result is expected, notthe period in which actions must necessarily commence.

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Premium Log Forecast |
|---|---|---|---|---|
| ◆ Short Term (1 - 20 yrs) | None | Short term harvests will come from existing older stands which are not treatable to improve quality. | Quality profile of existing old growth will prevail. Assume this is equal to a recent coast-wide estimate of 15%. | 15%? |
| ◆ Mid Term (21 - 70 yrs) | As above. | As above. | As above. | Steady decline to long term level. |
| ◆ Long Term (71 + yrs) | Q1. Two lift prune 25 ha/yr to 5.5 m. | 1. Max **historic program has been 50 ha/yr**. This equates to 25 ha under 2-lift management. If this were an annual program, would equal (25/480 ha/yr harvested =) 5% of THLB. If 5 m = 25% of tree vol, (.05 X .25 =) 1.25%/yr of future harvest volume will be clear logs resulting from pruning.<br>Because of epicormic branching problems with spruce, this species is best pruned once the prunable branches have died.<br>Pruning only the dominant trees in a stand will yield a greater clear volume at lower cost. Estimate this could increase clear log component to 2.5% with a 50 ha/yr pruning program.<br>The following guesses were made at the % clear volume which could result from extended rotations due to caribou habitat requirements.<br>Age — % clear by species<br>S C H<br>250: 1 12 5<br>140/150: 0 3 3<br>100: 0 0 0<br>If Cw is 20% of future species, the caribou zone is 50% of the total land base and extended rotations are on 10% and 40% of the caribou zone, the future % of clear Cw on an unmanaged, extended ro- | 1. | 2.5% clear log content. See also the large log analysis below. |

| Response Time Frame | Potential Strategy/Action | Discussion / Current Status | Anticipated Result | Premium Log Forecast |
|---|---|---|---|---|
| | | tation basis would be as follows:<br>On areas managed to age 250: = .2 X .5 X .1 X .12 = 0.1%<br>On areas managed to age 140: = .2 X .5 X .4 X .03 = 0.1%<br>Total 0.2%<br>However, meeting the objective of managing for caribou stand conditions at younger ages would virtually eliminate this clear log component. | | |

## Large Premium Log Analysis

Spacing for the purpose of improving future timber quality was not assessed during the workshop. A post-workshop large log analysis (below) indicates that with a 120 ha/yr spacing program approx. 5.9% of future volumes harvested would consist of large premium logs assuming all stands are harvested at culmination. If regenerated stand volumes were increased by 20% (high by current best estimate) and allowing for delayed harvesting due to caribou constraints, this could rise to approx 8.8%. A projection of large premium log content without spacing was not conducted, but would likely be somewhere in the 4% range, based on analyses done for other TSA's.

It should be noted that the large log specifications for the Revelstoke TSA are likely high compared to other interior locations. In particular, based on TIPSY, the spruce specifications are largely unmet. (The need for further investigation of TIPSY modeling of spruce has been noted elsewhere.) Given spruce is the most common species, this is a significant shortfall in meeting the large log requirements.

Another observation from the large log analysis is that from scenario 2, all else being equal, cedar stands would be the best candidates for managing for longer time frames for caribou habitat. Periodic annual increment (PAI) for cedar over the 50 years from culmination at age 110 to age 160 is 5.0 m3/ha/yr, more than 2 time the PAI of spruce between culmination age 100 and age 160. Again, the poor spruce showing may be related to TIPSY limitations.

Assumptions

Avg. annual area harvested = 480 ha Utilization std = 12.5 cm dbh for all species

TIPSY ver 2.1d OAF1 = 15% OAF2 = 5% Ages in 10 yr steps All areas planted to 1500 sph.

all species to 35 cm large log, except Sw which is 45 cm. Because TIPSY table dbh classes are mid points, this translates in TIPSY yield tables to 40 and 50 cm respectively

% ≥ 40/50 cm is from TIPSY stock table, rounded to nearest 5%.

Bottom 5m log = 25% of tree vol.

% large of total ann. harv. volume = (Area/480) X (%≥40/50 cm) X (25% of tree vol.)

Assume ¼ of areas are spaced (120 ha/yr total), of this 60 ha is in Hw, 30 ha in Cw, 15 ha in each of Fd and Pl, none in Spruce or Ba.

## SCENARIO 1

SI from SIBEC/ISIS project.

Expected future species profile.

| Species | %inv | SI | Space frm/to: | Area | Cul Age | Yield | % ≥ 40/50cm | % large |
|---|---|---|---|---|---|---|---|---|
| Sw | 35 | 15 | 1500/unspaced | 170 | 110 | 366 | 1[1] | 0.0 |
| Hwi | 25 | 18 | 4000/900 | 60 | 110[2] | 477[3] | 45 | 1.4 |
| | | | 1500/unspaced | 60 | 100 | 464 | 25 | 0.8 |
| Cw | 20 | 18 | 3000/900 | 30 | 130[2] | 622[4] | 70[5] | 1.1 |
| | | | 1500/unspaced | 65 | 120 | 587 | 45 | 1.4 |
| Fdi | 10 | 23 | 3000/900 | 15 | 100 | 475 | 55 | 0.4 |
| | | | 1500/unspaced | 30 | 100 | 480 | 45 | 0.7 |
| Pl | 5 | 22 | 4000/900 | 15 | 70[2] | 343[6] | 15 | 0.1 |
| | | | 1500/unspaced | 10 | 60 | 305 | 5 | 0.0 |
| Ba | 5 | - | 1500/unspaced | 25 | | | | 0.0 |
| Total | | | | 480 | | | | 5.9 |

5.9% premium log content, 3.0% from spaced stands and 2.9% from unspaced stands. Without pruning none of this will be clear.

[1] only Sw has req'mt of >50 cm.

[2] spacing raises culmination age

[3] 431 at age 100

[4] 574 at age 120

[5] % likely higher - some 2nd logs will be ≥ 40cm

[6] 291 at age 60

## SCENARIO 2

Expected future species profile.

20% yield gain modeled by choosing SI yielding nearest to a 20% MAI gain over SIBEC/ISIS project SI's for spaced stands.

½ of unspaced stands held until age 160 to reflect caribou requirements.

| Species | %inv | SI | Space frm/to: | Area | Cul/Rot Age | Yield | % ≥ 40/50cm | % large |
|---|---|---|---|---|---|---|---|---|
| Sw | 35 | 17 | 1500/unspaced | 85 | 100 | 390 | 1[1] | 0.0 |
| | | | | 85 | 160 | 493 | 5 | 0.2 |
| Hwi | 25 | 20 | 4000/900 | 60 | 110[2] | 570[4] | 60 | 1.9 |
| | | | 1500/unspaced | 30 | 90 | 493 | 25 | 0.4 |
| | | | | 30 | 160 | 770 | 70[3] | 1.2 |
| Cw | 20 | 20 | 3000/900 | 30 | 110 | 654 | 70[3] | 1.1 |
| | | | 1500/unspaced | 30 | 110 | 665 | 55 | 0.9 |
| | | | | 35 | 160 | 915 | 75[3] | 1.4 |
| Fdi | 10 | 25 | 3000/900 | 15 | 100 | 562 | 70[3] | 0.5 |
| | | | 1500/unspaced | 15 | 100 | 560 | 60 | 0.5 |
| | | | | 15 | 160 | 745 | 85[3] | 0.6 |
| Pl | 5 | 24 | 4000/900 | 15 | 60 | 347 | 15 | 0.1 |
| | | | 1500/unspaced | 5 | 60 | 357 | 5 | 0.0 |
| | | | | 5 | 90[5] | 463 | 15 | 0.0 |
| Ba | 5 | - | 1500/unspaced | 25 | | | | 0.0 |
| Total | | | | 480 | | | | 8.8 |

8.8% large premium log content, 3.6% from spaced stands and 5.2% from unspaced stands. Some of this will be clear.

[1] only Sw has req'mt of >50 cm.

[2] spacing raises culmination age

[3] % likely higher - some 2nd logs will be ≥ 40cm

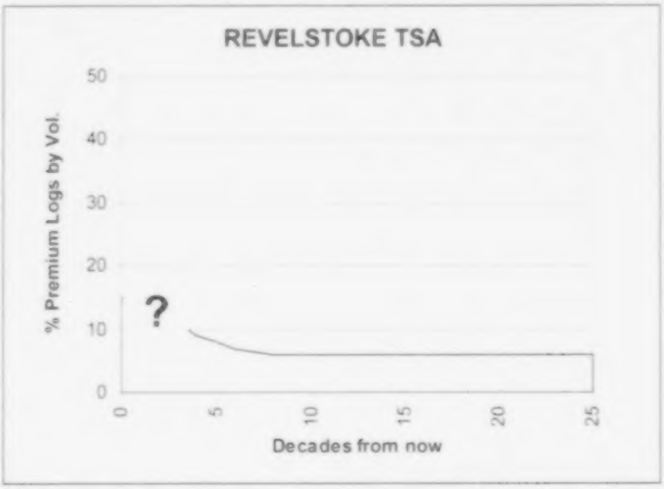
[4] 462 at age 90

[5] TIPSY data only goes to age 90

## Timber Quality Forecast

The foregoing analysis indicates the premium log content of harvests in the mid and long term will be lower than today's levels (4-6% forecast vs. assumed current estimate of 15%).

Postponing harvest to ages that are past culmination age would increase the large dimension component of premium logs. This is a significant factor in this TSA, given the requirements in the caribou zone (49% of THLB) to maintain 40% of stands ≥ 140 yrs of age and 10% ≥ 250 yrs. However, it is unknown how much of this requirement is met within the THLB.



This quality forecast is for a combination of clear logs and large-dimension logs. Large logs could form 6% of future harvests (based on spacing 120 ha/yr) and clear logs 2.5% (based on pruning 50 ha/yr). Some large logs will also be clear logs.

**Figure 10. Potential Quality Forecast, Revelstoke TSA**

# *Incremental Silviculture Strategy*

This section synthesizes the preceding background information, workshop discussion and subsequent analysis into an incremental silviculture strategy for the TSA.

## General Strategy

The primary objectives of the silviculture strategy are to:

- increase regenerated stand volumes by 7%;
- space 5 000 ha of stands in the harvest queue for decades 8 and 9 to ensure they will be of merchantable size at that time;
- research the desired stand characteristics for caribou lichen forage production in order to determine the need and opportunity, if any, for silvicultural management of stands for this purpose; and
- partially offset anticipated future lower log quality by pruning 50 ha/yr of suitable young stands (the requirements for significant areas to be in an older forest condition will also contribute to higher quality future stands).

Accomplishing these objectives requires a program substantially above historic levels.

## Working Targets

The preceding analysis indicates the following working targets are attainable. Figure 11 illustrates these. Achieving these targets requires a substantially higher incremental silviculture program level than in the past.

**WT 1 (Quantity)**: Manage long term timber supply to yield a harvest of 0.22 million m3/yr.

**WT 2 (Quality)**: Manage regenerated stands to yield at least 6% (by volume) premium large logs having a 2.5% clear log component, with the majority of the remainder being of sawlog quality.

*The preceding working target for timber quantity and Figure 11 below incorporate an upwards adjustment for increased site productivity. Other, potentially negative influences may exist but are not accounted for. The targets may require adjustment following the chief forester's TSR2 AAC determination which was not yet released at the time these targets were developed.*

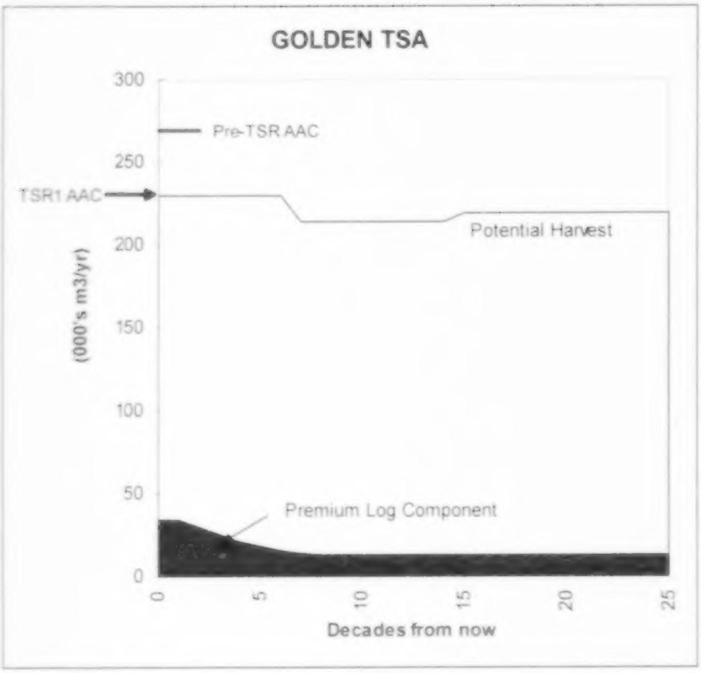


**Figure 11. Combined Potential Quantity and Quality Harvest Forecasts, Revelstoke TSA**

## Log Product Objectives

The following are product objectives at the log level for the Revelstoke TSA.

| Quality Class | Species | Characteristics |
|---|---|---|
| **Premium Log:** | S | 45+ cm minimum average stand diameter at breast height (DBH), some clear wood component. |
| | Hw, Cw | 35+ cm minimum average stand DBH, some clear wood component. |
| **Sawlog:** | All | 25+ cm minimum average stand DBH. |

## Silviculture Strategies

The following strategies have identified potential to maintain and/or increase the quantity and quality of the timber supply of the Revelstoke TSA. Strategy numbers correspond with those recorded earlier.

- ### Strategies to Increase the Quantity of Future Timber Supply

Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness. Some practices are pre free-growing and are not likely to be undertaken by licensees without funding assistance if free growing obligations can be achieved without them.

These strategies are supported by specific silvicultural regimes listed on page 38 along with investment priorities.

| No. | Strategy | Priority |
|---|---|---|
| General | Conduct silviculture surveys in support of all strategies. | 1 |
| ***Short Term*** | | |
| | There are no strategies to increase the quantity of timber in the short term. | |
| ***Mid Term*** | | |
| **MT2** | (See "Summary of Information and Research Needs.") | |
| **MT4** | Ensure stands at the beginning of the long term harvest queue (decades 8 & 9) are available by spacing 5 000 ha of dense hemlock/cedar stands over 10 years. | 4 |
| ***Long Term*** | | |
| **LT1** | Maintain the timber harvesting land base by: | |
| | (a) Treating approximately 200 ha of backlog NSR. | 3 |
| | (b) Maintaining approximately 400 ha of previously reforested backlog plantations. | 2 |
| **LT2** | Survey 1 600 ha of deciduous stands to determine their potential and suitable silviculture treatments. | |
| **LT3** | Increase the volume of regenerated stands by 7% by: | |
| | i) using improved seed as available (currently available for 80% of spruce stock); (increase) | 2 |
| | iii) using larger planting stock on approximately 20% of areas; (increase) | 7 |
| | iv) fertilizing approximately 80% of trees at the time of planting; (increase) [ does not match workshop writeup] | 5 |
| | v) brushing 400 ha/yr for growth enhancement (i.e., not only for survival); (increase) and | 6 |
| | vii) repeat fertilize 450 ha/yr on a 15 yr return cycle. | 8 |
| **LT4** | Continue MT 2 as appropriate. | |

### ♦ Strategies to Increase the *Quality* of Future Timber Supply

| No. | Strategy | Priority |
|---|---|---|
| **Q1** | Prune 25 ha/yr to 5.5 m in two lifts (requires a program of 50 ha/yr) to create knot-free timber in the bottom 5.0 m log. | 4 |

### ♦ Strategies to Increase the *Quantity* or *Quality* of Future Habitat Supply

The following strategy has identified potential to increase the quality or quantity of the habitat supply of the Revelstoke TSA.

| No. | Strategy |
|---|---|
| | No specific strategies proposed at this time. See "Summary of Information and Research Needs for caribou habitat." |

# *Silviculture Regimes and Investment Priorities*

The following table indicates incremental silviculture regimes which are suitable to attaining the above working targets and strategies.

| Regimes | Strategy | Opportunity Area (Ha/Yr) | Timber Supply Effects Short | Timber Supply Effects Medium | Timber Supply Effects Long | Quality | Habitat | Jobs Days/ha | Direct Cost $/ha[1] | Wkshp Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| **Surveys** | | 3600 | | | | | | | 25 | 1 |
| **Backlog** | | | | | | | | | | |
| 1 rehab site prep | LT1a | 100 | 0 | 0 | ++ | ++ | + | 1 | 800 | 3 |
| 2 rehab planting | LT1a | 100 | 0 | 0 | ++ | ++ | + | 1 | 400 | 3 |
| 3 brushing (plant + maintenance) | LT1a,b | 400 | 0 | + | ++ | ++ | + | 1.5 | 500 | 2 |
| **Pre FTG**[1] | | | | | | | | | | |
| 4 improved seed | LT1 | 250 | 0 | 0 | +++ | + | 0 | | | 2 |
| 5 large stock | LT3 | 100 | 0 | 0 | + | + | 0 | 0.5 | 400 | 7 |
| 6 fertilize at planting | LT3 | 480 | 0 | 0 | + | + | 0 | 0.1 | 150 | 5 |
| 7 brushing for growth | LT3 | 400 | 0 | 0 | + | + | 0 | 1.5 | 500 | 6 |
| **Post FTG** | | | | | | | | | | |
| 8 space | MT4 | 500 | 0 | ++ | 0 | 0 | +/- | 2.5 | 800 | 4 |
| 9 fertilize (multi fert) | LT3 | 450 | 0 | + | + | 0 | +/- | 0.1 | 250 | 8 |
| 10 Prune (spaced) 1st lift | Q3 | 25 | 0 | 0 | 0 | +++ | +/- | 4 | 800 | 4 |
| 11 Prune (spaced) 2nd lift | Q3 | 25 | 0 | 0 | 0 | +++ | +/- | 4 | 800 | 4 |

[1] FTG - Free to Grow. Pre-FTG activities are not included in the program or jobs table.

# Incremental Silviculture Program

The following annualized program will contribute to achieving the above goals and strategies. This program is considerably above historic levels and some activities may require phasing in. However, it does not include activities that may be required for caribou habitat management (pending research results). Spacing and pruning goals represent an anticipated upper bound. Lesser program levels should be oriented to specific target stands as shown in the regime table.

**Program Table - Ha, Revelstoke TSA, March 1999 (not including Pre-FTG activities)**

| Year | Surveys* | Backlog Site Prep | Backlog Planting | Backlog Brushing | Space | Prune | Fertilize |
|---|---|---|---|---|---|---|---|
| 1 | 3,600 | 100 | 100 | 400 | 500 | 50 | 450 |
| 2 | 3,600 | - | 100 | 300 | 500 | 50 | 450 |
| 3 | 3,600 | - | - | 200 | 500 | 50 | 450 |
| 4 | 3,600 | - | - | 200 | 500 | 50 | 450 |
| 5 | 3,600 | - | - | 100 | 500 | 50 | 450 |
| Subtot Yr 1 - 5 | 18,000 | | 200 | 1,200 | 2,500 | 250 | 2,250 |
| 6 - 10 | 18,000 | - | - | 150 | 2,500 | 250 | 2,250 |
| Total Yr 1 - 10 | 36,000 | | 200 | 1,350 | 5,000 | 500 | 4,500 |

* Includes prescription and layout

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unit cost ($/ha) | 25 | 800 | 400 | 500 | 800 | 800 | 250 |

**Program Table - $ 000s, Revelstoke TSA, March 1999 (not including Pre-FTG activities)**

| Year | Surveys* | Backlog Site Prep | Backlog Planting | Backlog Brushing | Space | Prune | Fertilize | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 90 | 80 | 40 | 200 | 400 | 40 | 113 | 963 |
| 2 | 90 | - | 40 | 150 | 400 | 40 | 113 | 833 |
| 3 | 90 | - | - | 100 | 400 | 40 | 113 | 743 |
| 4 | 90 | - | - | 100 | 400 | 40 | 113 | 743 |
| 5 | 90 | - | - | 50 | 400 | 40 | 113 | 693 |
| Subtot Yr 1 - 5 | 450 | 80 | 80 | 600 | 2,000 | 200 | 563 | 3,973 |
| 6 - 10 | 450 | - | - | 75 | 2,000 | 200 | 563 | 3,288 |
| Total Yr 1 - 10 | 900 | 80 | 80 | 675 | 4,000 | 400 | 1,125 | 7,260 |

# Job Outcomes

The following are the anticipated job outcomes associated with the preceding program, assuming the program is maintained into the future as necessary to achieve the working targets. The long term jobs table includes the potential harvest increment associated with caribou habitat management on the basis that either the habitat requirements will prove (through research conducted under this strategy) to be either currently over-stated or if not, to be achievable at younger stand ages through silvicultural treatments.

**Program Job Outcomes, Revelstoke TSA, March 1999 (not including Pre-FTG activities)**

***Short term*** *employment associated with undertaking the silviculture activity, in person years*

| Year | Surveys | Backlog Site Prep | Backlog Planting | Backlog Brushing | Space | Prune | Fertilize | Total |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.80 | 0.50 | 0.50 | 3.00 | 6.25 | 1.00 | 0.23 | 13.28 |
| 2 | 1.80 | - | 0.50 | 2.25 | 6.25 | 1.00 | 0.23 | 12.03 |
| 3 | 1.80 | - | - | 1.50 | 6.25 | 1.00 | 0.23 | 10.78 |
| 4 | 1.80 | - | - | 1.50 | 6.25 | 1.00 | 0.23 | 10.78 |
| 5 | 1.80 | - | - | 0.75 | 6.25 | 1.00 | 0.23 | 10.03 |
| Subtot Yr 1 - 5 | 9.00 | 0.50 | 1.00 | 9.00 | 31.25 | 5.00 | 1.13 | 56.88 |
| 6 - 10 | 9.00 | - | - | 1.13 | 31.25 | 5.00 | 1.13 | 47.50 |
| Total Yr 1 - 10 | 18.00 | 0.50 | 1.00 | 10.13 | 62.50 | 10.00 | 2.25 | 104.38 |

Note: Assumes 200 days of harvesting, silviculture work, and timber processing = 1 job (Source Revelstoke TSR2 SEA)

***Long term*** *employment associated with improved quality and quantity of the timber resource*[1]

| Decade | Harvest Increment ('000 m3) | Incremental Jobs per year by decade TSA[2] | Incremental Jobs per year by decade Prov[3] | Incremental Jobs Total by decade TSA[2] | Incremental Jobs Total by decade Prov[3] |
|---|---|---|---|---|---|
| 1 | - | - | - | - | - |
| 2 | - | - | - | - | - |
| 3 | - | - | - | - | - |
| 4 | - | - | - | - | - |
| 5 | 23 | 32 | 65 | 320 | 646 |
| 6 | 44 | 61 | 124 | 612 | 1,236 |
| 7 | 28 | 39 | 79 | 389 | 787 |
| 8 | 28 | 39 | 79 | 389 | 787 |
| 9 | 28 | 39 | 79 | 389 | 787 |
| 10 | 28 | 39 | 79 | 389 | 787 |
| 11 | 28 | 39 | 79 | 389 | 787 |
| 12 | 28 | 39 | 79 | 389 | 787 |
| 13 | 28 | 39 | 79 | 389 | 787 |
| 14 | 28 | 39 | 79 | 389 | 787 |
| 15 | 28 | 39 | 79 | 389 | 787 |
| 16 | 28 | 39 | 79 | 389 | 787 |
| 17 | 28 | 39 | 79 | 389 | 787 |
| 18 | 28 | 39 | 79 | 389 | 787 |
| 19 | 28 | 39 | 79 | 389 | 787 |
| 20 | 28 | 39 | 79 | 389 | 787 |
| 21 | 28 | 39 | 79 | 389 | 787 |
| 22 | 28 | 39 | 79 | 389 | 787 |
| 23 | 28 | 39 | 79 | 389 | 787 |
| 24 | 28 | 39 | 79 | 389 | 787 |
| 25 | 28 | 39 | 79 | 389 | 787 |
| Total | | | | 8,326 | 16,832 |

Notes:

1 Assumes continuation of on the incremental silvicture program beyond the first 10 years, in accordance with the strategy. The total harvest increment is associated with all the silvicultural practices documented in the "Opportunities" section and is only partly attributable to spacing and fertilization practices. Some of the increase may be associated with pre-free growing silviculture that was not current practice at the time of TSR2.

2 Assumes 1.39 TSA level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre (Source: Revelstoke TSR2 SEA Table 13, p

3 Assumes 2.81 Province level direct (harvesting, silviculture, processing), indirect and induced (PYs) per 1000 cubic metre (Source: Revelstoke TSR2 SEA Table 1

# Summary of Information and Research Needs

During the assessment process, the following needs for further information and research became apparent. The outcome of these have implications for an incremental silviculture strategy. Bracketed numbers refer to the strategy numbers under which the need is identified (see tables in "Workshop Review of Potential Strategies," page 15.

1. Conduct the following research and assessments related to lichen forage production for caribou to determine if silvicultural actions can be beneficial: (MT2)
   a) Research the desired stand characteristics for caribou lichen forage production and determine at what age they occur.
   b) Conduct additional FSSIM modeling and analysis of the medium and high emphasis biodiversity constraints. It is unknown how the imposition of these biodiversity constraints might affect the results of the special caribou run and when the ages at which caribou constraints no longer become limiting.
   c) If research indicates the desired stand characteristics do not occur unaided at desired younger ages (or if ages are older than currently modeled), design and apply silvicultural treatment regimes to create them. The extent of the benefit to the harvest forecast would depend upon the availability of treatable stands and the economics of silvicultural treatments. Conduct field analysis to locate these stands and determine the total opportunity.
2. TIPSY yields and diameters for older spruce stands require confirmation. (MT2)
3. Further analysis of suitability and effect of fertilizing young Fdi and Pl stands for the purpose of ensuring these stands are of merchantable size in 80-90 years is needed. (MT4)
4. A survey of deciduous stands is required to determine their potential and suitable silviculture treatments, if any. (LT2)
5. Fertilization trials are needed to determine if the fertilizable land base could be expanded to include spruce or hemlock. (LT3)
6. OAF 1 factor of 15% requires confirmation. Survey techniques are available. Requires statistical validity at the management unit level if to be used for AAC determination. (LT3)
7. Further study of root rot management techniques and options is needed. (LT5)
8. Old growth site index estimation studies require completion. It is anticipated that site indexes may be underestimated for Cw and Hw.

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# Abbreviations

The following abbreviations may be used.

| | |
|---|---|
| AAC | allowable annual cut |
| CF | chief forester |
| CT | commercial thinning |
| DBH | diameter at breast height |
| ESSF | engelmann spruce - subalpine fir (ecological zone) |
| FCC | forest cover constraints |
| FG | free growing |
| FRBC | Forest Renewal BC |
| ICH | interior cedar-hemlock (ecological zone) |
| IHL | initial harvest level |
| IRM | integrated resource management |
| KBLUP | Kootenay-Boundary Land Use Plan |
| LT | long term |
| LTHL | long term harvest level |
| LRSY | long run sustained yield |
| MoELP | Ministry of Environment, Lands and Parks |
| MoF | Ministry of Forests |
| MS | montane spruce (ecological zone) |
| MT | mid term |
| NCBr | non-commercial brush |
| NSR | not satisfactorily restocked |
| OAF | operational adjustment factor |
| OLB | operable land base |
| SBFEP | small business forest enterprise program |
| SI | site index |
| ST | short term |
| TFL | tree farm licence |
| THLB | timber harvesting land base |
| TIPSY | table interpolation program for stand yields |
| TSA | timber supply area |
| TSR | timber supply review |
| VDYP | variable density yield projection |
| VQO | visual quality objective |
| WT | working target |

Species abbreviations: B or Ba - balsam fir; Cw - western redcedar; Fd - Douglas-fir; Fdi - interior Douglas-fir; Hw - western hemlock; Pl - lodgepole pine; S - spruce species.

Site class abbreviations: G - good; M - medium; P - poor; L - low.

# Appendix A: Additional Document Detail

| Section | Source | Prepared |
|---|---|---|
| Strategy at a Glance | Executive Summary - captures the essence of the final silviculture strategy. | Post - workshop. |
| Basic Data | Timber Supply Review reports. | Pre-workshop. |
| Issues | | |
| - Individual Issue Analysis | Consultant's review and analysis of available documentation, mostly Timber Supply Review reports, in advance of preparing potential strategies for workshop discussion. | Pre-workshop. |
| - Illustration of Issues and Silvicultural Opportunities | Charts - timber supply review, prepared pre-workshop as a Powerpoint presentation to facilitate workshop discussion of issues and opportunities.<br>Commentary - added post workshop but largely illustrates the findings of the individual issue analysis. May incorporate some workshop findings. | Pre-workshop, workshop, post-workshop. |
| - Summary of Issues by Period | Prepared in advance of the workshop as a summary of the timber supply dynamics of the management unit, to facilitate development of potential strategies for workshop discussion. May be amended post-workshop to incorporate new insights, findings resulting from the workshop review. | Mostly pre-workshop. Some post-workshop. |
| Incremental Silviculture History | Past history - Timber Supply Review. Current history - workshop participants. | Pre-workshop, workshop. |
| Higher Level Goals and Objectives | Ministry of Forests documents - see references | Pre-workshop. |
| Opportunities to Increase Timber Supply | | |
| - Potential Strategies | Consultant's proposals, based on the issue analysis, to facilitate workshop discussion. Strategy numbers are carried throughout the documentation for tracking purposes. Potential strategies can be related back to the Silvicultural Opportunities columns of the issue analysis. | Pre-workshop. |

| Section | Source | Prepared |
|---|---|---|
| - Workshop Review of Potential Strategies | Documentation of the workshop session. | Workshop |
| - Potential Harvest Forecast | Consultant's illustration of strategy potential based on workshop results. | Post workshop. |
| Opportunity to Improve Timber Quality | Note: The lack of available information on timber quality and habitat supply limited pre-workshop development of these aspects of the strategy. | |
| Product Objectives | District's statement of objectives and workshop discussion. | Pre-workshop, workshop. |
| Potential Strategies | Partially consultant's proposals to facilitate workshop discussion. Mostly developed in the workshop. Strategy numbers are carried throughout the documentation for tracking purposes. | Some pre-workshop, mostly workshop. |
| Large Premium Log Analysis | Prepared by consultant in advance of workshop to facilitate workshop discussion. Modified afterwards to reflect workshop strategies. | Pre-workshop, workshop, post-workshop |
| Potential Quality Forecast | Consultant's illustration of strategy potential based on workshop results. | Post workshop. |
| Opportunities to Improve Habitat Supply | Proposed by workshop participants. Incorporates post workshop commentary by MoELP. | Workshop, post-workshop. |
| Silviculture Strategy | Summation of the findings of the workshop, translated into a strategy. Only those potential strategies deemed feasible by workshop participants are kept. Strategy numbers correspond with those initially proposed for tracking purposes (which are founded in the issue analysis). Strategies are ranked in keeping with the treatment rankings of the regime table. | Post workshop. |
| Silviculture Regimes and Investment Priorities | Prepared during the workshop. Recorded here as part of the final strategy (rather than under the workshop) to avoid unnecessary duplication. | Workshop. |
| Silviculture Program | Basic program elements prepared during the workshop. Program developed later by consultants. | Workshop, post workshop. |
| Job Outcomes | Basic factors from workshop participants. Calculations performed later by consultants. | Workshop, post workshop. |

# Appendix B: Detailed Issues and Silvicultural Opportunities Analysis

## Timber Quantity Issue Analysis

The following information is primarily from documentation produced under the second timber supply review, or TSR2. Sources are noted, with full references given on page 41. Only information which is relevant to a silviculture strategy is recorded. Unless otherwise specified, page references are to the TSR 2 timber supply analysis report for the Revelstoke TSA. Key statements are bolded.

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| ♦ Harvest Forecast | The initial harvest level of 230 000 m3/yr (TSR1 AAC) can be maintained for 4 decades, followed by successive declines of 10%/decade over 3 decades to a long term harvest level of 159 000 m3/yr (31% below the TSR1 AAC) reached 70 years from now. (p. 20-21)<br>Harvest levels must decrease to the LTHL because over time less harvesting occurs in high-volume, older stands and more in second-growth stands which are harvested at younger ages and therefore generally have lower volumes. (p. 22)<br>The first regenerated stands become available for harvest in 60 years (p. 23). After 100 years, the majority of the harvest is from regenerated stands (p. 26). A small number of existing stands continue to be harvested past this point (p. 36).<br>**If all stands were harvested at the age of maximum productivity, LTHL would be 28% higher than the base case.** | Most TSA's have a LRSY 5-10% above LTHL. The 28% gap indicates significant constraints on LT. This appears to be largely associated with caribou habitat requirements. | | |
| ♦ Age Class | Approximately 24% of stands in the timber harvesting land base (THLB) are 20 years or younger, including stands in the not satisfactorily restocked (NSR) and regeneration (Regen) categories. Only 19% of stands are between 21 and 140 years old, and 57% are older than 140 years. (see pie chart) | Overall, there is an abundance of older forests and a high proportion of stands younger than 20 years old. There are relatively few stands in between which results in fairly rapid transition | | |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | | to LTHL by 7th decade. | | |
| ◆ Silvicultural Systems | Silvicultural systems not explicitly stated. 97% of the THLB is currently managed under a clearcut harvesting system (Hawe, 1996:37). Analysis report Table A-17 indicates all areas are planted with a 2 yr regen delay, except for backlog NSR areas which are expected to regenerate naturally over a 3 year period (p.108-9). Planting is to similar species to those harvested. (p 11) | | | |
| ◆ NSR | Total NSR = 4 918 ha, of which 3 128 is current (referred to in this document as RWS for 'regenerating within standards') and 1 800 ha is backlog NSR (referred to as NSR). (p.111) All NSR was included in the analysis, to be regenerated under different analysis units, depending upon existing stocking levels. (p. 110) RWS area assumed for normal stocking of 1 500 st/ha. | | | Failure to restock NSR would result in a slightly lower LTHL than in the base case. |
| ◆ Land Base | New inventory classified 19 000 more ha of productive forest, of which 4 942 ha (7%) is in THLB. (p. 52)<br>• 1 597 ha of deciduous stands (equiv to 2% of THLB) deducted from THLB (p. 9).<br>• 1 176 ha (equiv to 2% of THLB) of low productivity forest types deducted from THLB. Stands with an SI below 8 are excluded on the basis they would not likely attain a 25 cm dbh before 120 years of age. (p.97)<br>• 4 868 ha (equiv to 7% of THLB) of hemlock pure stands (3 473 ha) or balsam-leading stands (1 395 ha) greater than 140 years of age deducted from THLB as non-merchantable based on current forest management practices and recent harvesting performance. (p. 97) These stands are physically operable and have adequate productivity but are not currently utilized due to low quality timber. (p. 8)<br>Sensitivity test ± 7% of THLB. Area in all stand types and ages both increased and decreased. (p. 52)<br>Decrease: (-7%) Moderately sensitive. Initial harvest level (IHL) can be maintained for 3 decades, 1 less than the base case. Same rate of decline as base case to long term harvest level (LTHL) 7% lower than base case.<br>Increase: (+7%) Moderately sensitive - initial harvest level can be maintained 1 decade longer than base case (5 vs 4). LTHL 7% above base case. | With the relatively small THLB this TSA is at risk to catastrophic fires and insect outbreaks. Risk of these occurring is relatively low, however. | Rehabilitate/convert deciduous (often in riparian areas) and/or non-merch types?<br>Fertilize low productivity stands? | |

Draft

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| ◆ Forest Cover | *Ungulate Winter Range, Caribou & Integrated Resource Management (IRM) Zones*: 15%, 49%, and 39% of THLB (p. 18).<br>Base case requirement of at most 25% of the THLB of the IRM zone and 25% of the operable land base of the wildlife zones permitted to be < green-up ht (2 m (p 102)).<br>Sensitivity test of ± 10% of area allowed to be not greened up. (p. 42-43)<br>Relax Constraint: (+10% to 35%) Insensitive. **Base case is not significantly affected by maximum disturbance levels in the wildlife & IRM zones.**<br>Increase Constraint: (-10% to 15%) Moderately sensitive - initial harvest level (IHL) can be maintained 3 decades, 1 less than the base case. LTHL 5% below base case. | The constraint threshold is somewhere between 15 - 20% of area not greened up. Relaxing the constraint beyond the threshold will not increase timber supply because other constraints then become limiting. | | |
| | *Visual Quality Zones*:<br>Retention - 2% of THLB; partial retention - 4% of THLB (p. 16). Base case requirement of at most 5% of retention and 15% of partial retention visual quality objective (VQO)) to be < 6 m tall (p 16).<br>Sensitivity test of either removing requirements entirely, or shifting the requirements to the next most restrictive category had no effect. (p.41) | | | |
| | *Green-up*:<br>Green-up period is a combination of green-up age and regen delay (p 40). Green-up ages are 15 yrs for 2m ht, 29 yrs for 6m ht (VQO + domestic watersheds) and 38 yrs for 9 m ht (community watersheds) (p. 102). Regen delay is 2 yrs (p 108-9).<br>Sensitivity test of ± 10 years in green-up period. (p. 40-41)<br>Relaxation of constraint: (- 10 yrs) Insensitive over short and mid term. LTHL slightly above base case (1%?).<br>Increase Constraint: (+ 10 yrs) Slightly sensitive - initial harvest maintained for 1 decade less than base case (3 vs. 4). LTHL 1% lower. An increase in ages restricts supply because at any time more area is likely to be below green-up age, meaning max disturbance limits are reached sooner. | The low response to reducing green-up age can be questioned. About 90% of the TSA is managed for 2m ht. with a 17 yr green-up period. Reducing this by 10 yrs means a green up period of 7 yrs. There should be a considerable productivity increase shown with this. LTHL avg. harvest age should drop from 105 yrs (p 26) to 95 yrs. **A 10% productivity increase could therefore be expected.** | Targeting reduction in time until green-up may offer more potential than indicated by the sensitivity test. (LT) | |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | *Caribou & Ungulate Winter Ranges - thermal cover requirements*:<br>(64% of THLB - 49% caribou, 15% ungulate) Base case modeled on basis that at all times at least 40% must be in stands 100 yrs or older in the ungulate winter range zone and in stands 140 or older in the caribou zone) and no more than 25% in stands less than 2 m tall. Unclear as to treatment of caribou requirement of 10% ≥ 250 yrs of age.<br>Sensitivity test of ± 5%, ± 10% of area from base case. (p.49)<br>Increase Constraint (+5, 10% to 45, 50%): IHL can be maintained 1 or 2 decades less than base case, respectively. LTHL basically insensitive to a 5% increase, but falls 6% below base case with a 10% increase. | See "*Uncertainty in the size of caribou zone*" below. | Opportunity to extend IHL (MT) and increase LTHL (LT) by emulating older forests sooner? **Would need to know impact of reduced ages** which was not modeled here (reduced area was modeled). | If the range requirements are underestimated by 10% the IHL can only be maintained for 2 decades and LTHL would Fall 6%. This presents some risk to the base case due to the uncertainty of requirements. |
| | Relax Constraint (-5, 10% to 35, 30%): A 5% relaxation gives similar but inverse response as a 5% increase (otherwise not discussed). A 10% relaxation allows the IHL to be maintained 2 decades longer (6 vs. 4) and increases LTHL by 6%. | | See below. | |
| | Additional info is provided in the analysis report re winter range only and caribou zone only sensitivities. A 5% increase in caribou habitat area lowers LTHL 5%, which appears to be greater than when all areas have increased requirements. A 10% increase does not change this much. (p 49). | | | |

Draft

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | *Uncertainty in the size of caribou zone:* (49% of THLB)<br>Base case includes requirements that at least 10% of the physically operable forest (an area larger than the THLB) must be in stands 250 years old or older and at least 40% of the operable forest be in stands 140 years or older. These requirements must be met within each landscape unit and in both the ESSF (11 084 ha) and ICH (21 896 ha) biogeoclimatic zone areas within each landscape unit (p. 15). These requirements are much more stringent than old-forest requirements for other values.<br>Sensitivity test of completely removing the caribou guidelines and of increasing the zone by 2 600 ha (4% of THLB). (p. 47-8)<br>Caribou guidelines removed: **Very Sensitive.** IHL extended 4 decades longer than the base case (8 vs. 4). LTHL 8% above base case. Over the 250 year analysis horizon cumulative harvests are 10.3% more than the base case.<br>Caribou zone expanded 2 600 ha: Short term insensitive. LTHL slightly below base case. | Other older forest cover requirements for the same area are less restrictive and have little or no impact on timber supply. (p. 48)<br>A 10% relaxation in the preceding sensitivity test (above) lengthened IHL 2 decades and increased LTHL 6%. **This indicates relaxing the requirement by ¼ reduces the total impact by ¾.**<br>Need to know impact of reduced ages (reduced area modeled). | Caribou guidelines are very restrictive on timber supply. Potential exists for incremental silviculture activities to help create stand conditions that meet the caribou requirements sooner (i.e., creating a forest structure that meets the needs at age 200 vs age 250 or age 100 vs 140). | The modeling methodology will likely overestimate the long term timber supply (see Golden TSR2 report, p 47). Opportunity to create old seral state within the THLB through spacing & CT regimes? |
| ◆ Biodiversity | *Landscape Level Old-Seral*<br>Biodiversity emphasis options were not modeled in the base case as landscape units had not been designated for the Revelstoke area. (p. 50) Sensitivity test of application of the MAC recommendations. The harvest forecast was insensitive to this change as well as to applying the low-emphasis biodiversity portion of the old-seral requirement at the beginning of the analysis horizon vs being phased in over 140 years as recommended by MAC. (p. 51) Timber supply is not highly sensitive to changes because mature and old forest stands outside the THLB on both the operable and inoperable forest are sufficient to meet most mature and old-seral requirements. | Base case LTHL is likely over-estimated. See "Age Class" above, "Biodiversity contribution from areas outside the THLB" below. | | Use CT to create old-seral stand structures at earlier ages? |
| | *Biodiversity contribution from areas outside the THLB*<br>Forested stands outside the THLB ("inoperable" stands) are aged but not regenerated. In 200 years the bulk of them are aged over 400 yrs with virtually none below 200 years of age (p. 30). Initially, very little of the THLB must be retained to meet older forest or wildlife habitat requirements. After 100 years, little older forest remains in the THLB. (p27). | Not regenerating stands in the OLB likely overestimates the timber supply. The effect is likely to be similar to that of increasing ungulate cover requirements 10%. This lowered LTHL 6%. | | Use CT to create old-seral stand structures at earlier ages. (MT, LT)<br>As forested areas |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | The following is from the Golden TSA. It is relevant to the Revelstoke TSA because the same modeling methodology of not regenerating stands outside the THLB was used.<br>[When the current age class distribution of forests outside the THLB is held constant the IHL must drop 5% below the base case and LTHL is about **10% lower**, due to the increased need to use stands within the THLB to meet seral stage requirements. The base case assumption that there will be no creation of young stands in forests outside the THLB does not likely represent the future distribution of the land base and **will likely overestimate the long term timber supply**. (Golden TSR2 analysis report, 46-47)] | | | outside of the THLB are damaged they may revert to NSR for long time periods. For those areas outside of parks, would it be of long term benefit to consider stocking establishment? (LT) |
| ◆ Min. Harvest Ages | Base case uses ages based on: age at which stands reach a min vol/ha (150 m3/ha); age to a min. 25 cm dia.; culmination age; and professional judgment. Selected min. ages range from 70 - 140 yrs for natural stands and from 60 - 140 yrs for managed stands (160 -200 yrs for backlog stands). (p 100)<br>Sensitivity analyses of ±20 yrs. (p 35-36) Changes affect the timing of the transition to the LTHL (p. v)<br>Decrease: (- 20 yrs) IHL is extended 1 decades longer than the base case (5 vs 4) followed by a decline of 10%/decade until LTHL reached at start of decade 9. **LTHL 3% below base case**, presumably due to stands being harvested before reaching culmination age.<br>Increase: (+20 yrs) **IHL can be maintained only 2 decades**, 2 less than in the base case. Timber supply in the transition period is substantially reduced. Regenerating stands must age an additional 20 years before they are considered merchantable. As a result, existing older stands must be harvested at a slower rate to allow regenerating stands to reach their harvestable age. Rate of decline same as in base case, so LTHL reached after 5 decades vs. base case 7. LTHL is 1% above base case since some stands are harvested closer to culmination age. | Base case min ages appear close to culmination age as LTHL shows little sensitivity to changes.<br>Increasing volumes at the same minimum age would be same as increasing regen stand vol's & will result in higher LTHL.<br>Base case use of TIPSY assumes stocking control at approx 1 500 st/ha. This is probably accurate, since in the Revelstoke TSA overstocking is not normally an issue. | | |

Draft

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| ◆ Timber Volume Estimates | Variable Density Yield Projection (VDYP) system used for existing stands older than 20 years. Table Interpolation Program for Stand Yields (TIPSY) used for all regenerated stands and existing stands aged 20 or less. (p. 14)<br>*Existing stand volumes*:<br>Sensitivity test for ± 10% in volume. **Short term very sensitive**. Long term slightly sensitive to either increase or decrease. (p. 36-37)<br>Increase: (+10%) IHL can be maintained 6 decades, 2 longer than the base case. Harvest level then drops 10%/decade to an LTHL slightly higher than the base case.<br>Decrease: (-10%) **Very sensitive**. IHL can only be maintained 2 decades (2 less than base case) before falling to a LTHL slightly below the base case LTHL. | TSA shows long term sensitivity to existing stand yields, because a small number of existing stands are still harvested in this time period. (p. 36) | Increasing vol's of existing stands would enable extending the current harvest level as well as raise mid and long term harvests. (MT, LT) | Inventory audit indicates volume estimates to be accurate. (p. 37) TSA not at significant risk. |
| | *Existing cedar or hemlock stand volumes*:<br>Estimates can vary because of difficulty of estimating volume loss to decay. (p. 38) Hemlock and cedar stands occupy 53% of the area of the THLB (p. 11) Stand volumes are similar to those of spruce and D-fir, the next most common species, so do not have a disproportionate effect. (p 112-3)<br>Sensitivity test for ± 25% in volume. **Short term very sensitive**. Long term slightly sensitive to either increase or decrease. (p. 38)<br>Increase: (+25%) IHL can be maintained 8 decades, 4 longer than the base case. Harvest level then drops 10%/decade to an LTHL slightly higher than the base case.<br>Decrease: (-25%) **Very sensitive**. IHL can only be maintained 1 decade (3 less than base case) before falling to a LTHL 3.7% below the base case LTHL. | The sensitivity results would indicate **existing stands contribute about (4 X 3.7%=) 15% of long term harvests**. Because average harvest age in LT is about 120 yrs these probably consist of the 19% of existing stands that are currently between 21 and 140 years old. | As above. | Not sure how this relates to the inventory audit that indicates the volume estimates used are reasonably accurate (p. 37). Is there a significant risk here? Not likely a silviculture opportunity to mitigate it if there is. |
| | *Regenerated stand volumes*:<br>TIPSY operational adjustment factor 1 (OAF1) - 15%; OAF 2 - 5% (p. 108-9).<br>Sensitivity tests for ± 10% in volume. Short term insensitive to either. **Highly sensitive to both in long term**. (p. 39) | No indication of whether improved seed is used and factored into regen volume estimates. Assume not.<br>Average growth rate for | Possibilities to increase regen vol's:<br>• Improved seed.<br>• Larger planting stock. | |

| Issue | Description | Discussion | Silvicultural Opportunities | |
|---|---|---|---|---|
| | | | Increase Over Base Case | Maintain Base Case |
| | Increase: (+10%) Short and mid term insensitive. LTHL 9% higher than base case, starting at the beginning of decade 7, one decade earlier than in the base case.<br>Decrease: (-10%) LTHL 9% below base case.<br>Effects are not fully proportional to the change in regenerated stand volumes because some existing stands continue to contribute over the long term. | managed stands is 25.5% more than for existing natural stands with no density control. (p. 23) (**35% in Golden TSA** - see Golden TSR2 analysis report p 54)<br>See comment under "min harv ages" re spacing for density control.<br>No mention of armillaria root rot. | • Reduce voids (OAF1).<br>• Fertilization at planting.<br>• Brushing for growth.<br>(LT) | |
| ♦ Site Productivity | Over 80% of the THLB is in ages that are difficult to accurately predict site productivity. (p 43) Higher productivity will affect regenerated stand volumes, green-up ages and minimum harvest ages. The largest volume increases occur for spruce, cedar and hemlock-leading stands on M or P sites. However, statistically sound data exists only for spruce.<br>Sensitivity test conducted by adjusting SI's according to OGSI results for spruce only (9% of THLB) and for all eligible stands (58% of THLB). Short term insensitive to either. (p. 44-5)<br>SI adjusted for spruce only: LTHL 3% above base case.<br>SI adjusted for all eligible stands: **LTHL 20% above base case**. Creates a minor shortfall below LTHL in decades 5 through 14. | Associated with the OGSI adjustment, min harvest ages may be 10-15 years lower and green-up ages 2-3 years lower for affected stands. See "green-up ages" above.<br>Sensitivity test hints at a change in forecast shape. Would an add'l 20% increase in regen vol's exacerbate the indicated mid term shortfall? | | |

# Timber Quality Issues

The timber supply review does not address the future quality of the timber resource. However, the review presents some information on harvested stand ages, which can be used as a broad surrogate for timber quality. Within limits, the older the stand the higher the timber quality.

## ◆ Available Information

The average harvested age over time is projected to decline in the next 60 years from an initial average of 320 years to 105 years. From decade 11 onwards most of the harvested stands are regenerated stands that have only recently reached minimum harvest ages, which range from 60 - 140 years. Starting in decade 14, average harvested age is about 120 years. (TSR2 report, 26)

Increasing minimum harvest ages has a substantial impact on the harvest forecast.

The caribou zone (49% of the THLB) has very high older forest requirements. At least 10% of the physically operable forest must be in stands 250 years old or older and at least 40% must be in stands 140 years or older.

## ◆ Discussion

Harvesting future stands at or near minimum ages indicates future timber quality will be much lower than today's. Timber will be of much smaller diameter, stem taper will tend to be greater, ring widths will be wider, there will be more juvenile wood content and there will be little clear wood.

There is some riskiness to maintaining a strictly volume-oriented focus at the expense of overall quality. Future markets must be such that a full diet of small diameter wood can be profitable. Secondary manufacturing opportunities, as well as manufacturing of very high quality products will become more limited.

The dilemma presented is choosing between volume and value. **However, some choices do not necessarily have to be made today**. Stand spacing can be performed now for the benefit of reducing minimum ages or for increasing stand value. Future markets and forest management policies will decide the ultimate allocation between quantity and quality. More attention likely is required for pruning decisions. Here, there will be trade-offs between potential log value, which could potentially increase with more time to add a larger clear-wood jacket, and earliest harvest to recover the pruning investment, which is more commensurate with timber quantity goals.

Modeling is required to have a better grasp of future timber quality scenarios.

## ◆ Silvicultural Opportunities

Pruning stands can develop a clear wood component to future harvests. Spacing can be used to increase the average diameters of some stands.

# Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement.
The template design allows completion in a consistent format for all management units across the province.
Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** Revelstoke TSA

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# Revelstoke TSA
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |

## Forest Health Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Habitat Supply and Biodiversity Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Domestic Range

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Enhanced Forestry Activities - Management Unit Total

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |

# Revelstoke TSA
# Backlog Program Table
# For the 2001/02 Fiscal Year

| **Activities** | **Treatment Area Goals (ha)** | | | | | **Plan 2001/02** | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| **Legal Obligations** | | | | | | | |
| Surveys | 59 | 50 | 50 | 50 | 50 | 27.54 | 1625 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 475 | 380 | 304 | 243 | 194 | 522.50 | 248187 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 534 | 430 | 354 | 293 | 244 | 467.81 | 249,812 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 249,812 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 1885 | 1000 | 500 | 500 | 500 | 27.50 | 51846 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 1885 | 1000 | 500 | 500 | 500 | 27.50 | 51,846 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total backlog reforestation** | | | | | | | 51,846 |
| **Impeded areas** | | | | | | | |
| Surveys | 615 | 1000 | 1000 | 1000 | 1000 | 27.50 | 16913 |
| Brushing | 152 | 0 | 0 | 0 | 0 | 881.03 | 133917 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 767 | 1000 | 1000 | 1000 | 1000 | 196.65 | 150,830 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 150,830 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 0 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 2559 | 2050 | 1550 | 1550 | 1550 | 27.50 | 70384 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 627 | 380 | 304 | 243 | 194 | 609.42 | 382104 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 3186 | 2430 | 1854 | 1793 | 1744 | 142.02 | 452488 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning | | | | | | | 0 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 452,488 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

**Revelstoke TSA**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

## *The following default provincial factors may be replaced by management unit specific factors.*

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| | Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| 1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)<br>Estimates of annual growth rate increase from each type of treatment over no treatment.<br>**Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| 2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.<br>**Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| 3) Corporate commitment to employment<br>Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.<br>**Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improve-ment | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 0 | | |
| Enter area of all other sites planted with improved trees | 300 | | |
| Total area affected by tree improvement | 300 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 0 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table | | | 2,559 |
| 33% of all silviculture surveys | | | 844 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 844 |

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 0 | | |
| Enter area of all other sites planted with improved trees | 300 | | |
| Total area affected by tree improvement | 300 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 0 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 2,559 |
| 33% of all silviculture surveys | | | 844 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 844 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)<br>Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | 115 |
| Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)<br>Estimate area that will be classified as free growing after a survey in 2001/2002 | | | 565 |

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity. 0

# Revelstoke TSA
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improve-ment | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inputs | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 300 | 0 | 844 | 0 | 0 | 627 | 0 | 0 | 0 | 1,771 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 7,995 | 0 | 25,414 | 0 | 1 | 10,189 | 0 | 0 | 0 | | 43,599 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 115 | | | | | | | | 115 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 565 | | | | | | | | 565 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 30 | 0 | 84 | 0 | 0 | 1,636 | 0 | 0 | 0 | 177 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 1 | 11 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# Revelstoke TSA
# Management Unit Summary Table
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| Backlog Program Field Activities | 3,186 | 2,430 | 1,854 | 1,793 | 1,744 | 142 | 452,488 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| **Totals** | 3,186 | 2,430 | 1,854 | 1,793 | 1,744 | | 452,488 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 43,599 $m^3$ |
| Estimated ha that will be reclassified as stocked | 115 ha |
| Estimated ha that will be declared as free growing | 565 ha |
| Estimated total full time equivalent positions generated | 11 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

## 2001/02 Sustainable Harvest Funding Recommendations ($)

| Activity | Management Unit (TSAs) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cranbrook | Invermere | Golden | Revelstoke | Arrow | Boundary | Kootenay Lk. | Total |
| **Backlog** | | | | | | | | |
| Planning/Surv./Presc. | 70000 | 75636 | 97371 | 70384 | 60500 | 57337 | 150193 | 581421 |
| Site Preparation | 160000 | 14280 | 0 | 0 | 0 | 81000 | 246000 | 501280 |
| Site Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0 | 20000 | 20000 |
| Seed Purchase | 8250 | 89496 | 0 | 0 | 0 | 36000 | 38300 | 172046 |
| Planting | 232200 | 163200 | 13200 | 0 | 100000 | 69000 | 73300 | 650900 |
| Brushing | 0 | 0 | 327140 | 382104 | 350000 | 273270 | 344900 | 1677414 |
| Density Spacing | 0 | 0 | 0 | 0 | 0 | 11900 | 0 | 11900 |
| Studies | 0 | 0 | 0 | 0 | 0 | 0 | 5000 | 5000 |
| **Sub-total** | **470450** | **342612** | **437711** | **452488** | **510500** | **528507** | **877693** | **3619961** |
| **Stand Tending** | | | | | | | | |
| Planning/Surv./Presc. | 22500 | 0 | 0 | 0 | 0 | 25000 | 0 | 47500 |
| Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spacing | 96000 | 418503 | 0 | 0 | 0 | 150000 | 0 | 664503 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0 | 5000 | 5000 |
| Fertilization | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Sub-total** | **118500** | **418503** | **0** | **0** | **0** | **175000** | **5000** | **717003** |
| **Habitat Supply** | | | | | | | | |
| Planning/Surv./Presc. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **588950** | **761115** | **437711** | **452488** | **510500** | **703507** | **882693** | **4336964** |

# 2000/01 Sustainable Harvest Work Plan Review ($)

| Activity | Management Unit (TFLs) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 3 | 8 | 14 | 23 | 55 | 56 | Total |
| **Backlog** | | | | | | | |
| Planning/Surv./Presc. | 26000 | 116049 | 26750 | 112431 | 15000 | 44694 | 340924 |
| Site Preparation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Site Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Seed Purchase | 13710 | 15000 | 0 | 0 | 12000 | 202 | 40912 |
| Planting | 40700 | 20100 | 0 | 0 | 32000 | 3840 | 96640 |
| Brushing | 132600 | 123500 | 0 | 285600 | 85860 | 44473 | 672033 |
| **Sub-total** | **213010** | **274649** | **26750** | **398031** | **144860** | **93209** | **1150509** |
| **FH Enhancement** | | | | | | | |
| Site Rehabilitation | | | | | | | |
| Spacing | | | | | | | |
| Pruning | 0 | 0 | 0 | 8000 | 0 | 0 | 8000 |
| **Sub-total** | **0** | **0** | **0** | **8000** | **0** | **0** | **8000** |
| **Stand Tending** | | | | | | | |
| Planning/Surv./Presc. | 0 | 0 | 12500 | 30539 | 0 | 8500 | 51539 |
| Studies | 0 | 0 | 0 | 150000 | 0 | 0 | 150000 |
| Spacing | 15000 | 0 | 80080 | 0 | 0 | 0 | 95080 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 54131 | 54131 |
| Fertilization | 0 | 0 | 87506 | 0 | 0 | 0 | 87506 |
| Other | 0 | 0 | 26099 | 0 | 0 | 0 | 26099 |
| **Sub-total** | **15000** | **0** | **206185** | **180539** | **0** | **62631** | **464355** |
| **Total** | **228010** | **274649** | **232935** | **586570** | **144860** | **155840** | **1622864** |

## Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement. The template design allows completion in a consistent format for all management units across the province. Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** TFL #14

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# TFL #14
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

Activities and hectares are estimates pending the completion of the Type II Analysis expected at the end of Aug/00

| **Activities** | **Treatment Area Goals (ha)** | | | | | **Plan 2001/02** | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 91 | 0 | 0 | 0 | 0 | 880.00 | 80080 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 359 | 0 | 0 | 0 | 0 | 243.75 | 87506 |
| Other | 350 | 0 | 0 | 0 | 0 | 53.14 | 18,599 |
| | | | | | | | |
| **Totals hectares** | 800 | 0 | 0 | 0 | 0 | 232.73 | 186,185 |
| Planning and prescriptions | | | | | | | 12,500 |
| **Total dollars** | | | | | | | 198,685 |

## Forest Health Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 7500 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 7,500 |

## Habitat Supply and Biodiversity Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Domestic Range

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Enhanced Forestry Activities - Management Unit Total

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 91 | 0 | 0 | 0 | 0 | 879.99 | 80,080 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 359 | 0 | 0 | 0 | 0 | 243.75 | 87,506 |
| Other stand tending activities | 350 | 0 | 0 | 0 | 0 | 74.57 | 26099 |
| **Totals hectares** | 800 | 0 | 0 | 0 | 0 | 242.10 | 193,685 |
| Planning and prescriptions | | | | | | | 12,500 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 206,185 |

Pending results of Type II Analysis and Foliar analysis

Includes the assessment & prescription, layout, & treatment of IU stands. They are ID as potential problem forest types. Costs per ha not reflective of one activity.

IWW study/Root collar weevil assessment

# TFL #14
## Backlog Program Table
## For the 2001/02 Fiscal Year

| **Activities** | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Legal Obligations** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 0 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 2000 | 0 | 0 | 0 | 0 | 13.38 | 26750 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 2000 | 0 | 0 | 0 | 0 | 13.37 | 26,750 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total backlog reforestation** | | | | | | | 26,750 |
| **Impeded areas** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 0 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 0 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 2000 | 0 | 0 | 0 | 0 | 13.37 | 26750 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 2000 | 0 | 0 | 0 | 0 | 13.37 | 26750 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning | | | | | | | 0 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 26,750 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

**TFL #14**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

## *The following default provincial factors may be replaced by management unit specific factors.*

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.
**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.
**Provincial factors for estimated value gain at harvest**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.
**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| Area | | |
|---|---|---|
| Tree Improvement | Nursery Seedling Production | Silviculture Surveys |

**A Tree Improvement**
**Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002**

| | Tree Improvement |
|---|---|
| Backlog area planted from backlog table | 0 |
| Enter area of all other sites planted with improved trees | |
| Total area affected by tree improvement | 0 |

**B Nursery production of seedlings**
Enter sowing requests from SPAR

**C Silviculture surveys**
Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.
These potentially provide improved estimates of site productivity and operational yield adjustment factors

| | Silviculture Surveys |
|---|---|
| Total EFP surveys from the EFP table | 0 |
| Total backlog surveys from the backlog table. | 2,000 |
| 33% of all silviculture surveys | 660 |

**Optionally, you may provide a more exact estimate:**

| | Silviculture Surveys |
|---|---|
| Estimate area of regen delay surveys | |
| Estimate area of free growing surveys | |
| Estimate area of pre-stand tending surveys | |
| Estimate of total surveys that will affect timber supply | (A) 0 |

Surveyed area that will affect timber supply
Replace with (A) if a more exact estimate is calculated 660

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)
Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.

The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| A Tree Improvement | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 0 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 0 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 2,000 |
| 33% of all silviculture surveys | | | 660 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 660 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)<br>Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | |
| Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)<br>Estimate area that will be classified as free growing after a survey in 2001/2002 | | | 350 |

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity. ☐

# TFL #14
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 0 | 0 | 660 | 0 | 0 | 0 | 91 | 0 | 359 | 1,460 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 0 | 0 | 19,863 | 0 | 1 | 0 | 0 | 0 | 7,234 | | 27,097 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 0 | | | | | | | | 0 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 350 | | | | | | | | 350 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 0 | 0 | 66 | 0 | 0 | 0 | 360 | 0 | 65 | 146 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 3.54 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# TFL #14
# Management Unit Summary Table
## For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 800 | 0 | 0 | 0 | 0 | 242 | 193,685 |
| Planning, prescriptions and seedlings | | | | | | | 12,500 |
| Backlog Program Field Activities | 2,000 | 0 | 0 | 0 | 0 | 13 | 26,750 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| **Totals** | 2,800 | 0 | 0 | 0 | 0 | | 232,935 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 27,097 $m^3$ |
| Estimated ha that will be reclassified as stocked | 0 ha |
| Estimated ha that will be declared as free growing | 350 ha |
| Estimated total full time equivalent positions generated | 4 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

# Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at
http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement.
The template design allows completion in a consistent format for all management units across the province.
Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** TFL #23

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# TFL #23
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| **Stand Tending** | | | | | | | |
| Surveys | 683 | 400 | 400 | 400 | 400 | 33.00 | 22539 |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 683 | 400 | 400 | 400 | 400 | 33.00 | 22,539 |
| Planning and prescriptions | | | | | | | 8,000 |
| **Total dollars** | | | | | | | 30,539 |
| **Forest Health Enhancement** | | | | | | | |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 16 | 150 | 150 | 150 | 150 | 500.00 | 8000 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 16 | 150 | 150 | 150 | 150 | 499.94 | 8,000 |
| **Habitat Supply and Biodiversity Enhancement** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Domestic Range** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Enhanced Forestry Activities - Management Unit Total** | | | | | | | |
| Surveys | 683 | 400 | 400 | 400 | 400 | 33.00 | 22,539 |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 16 | 150 | 150 | 150 | 150 | 499.97 | 8,000 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 699 | 550 | 550 | 550 | 550 | 43.69 | 30,539 |
| Planning and prescriptions | | | | | | | 8,000 |
| **Studies funding** | | | | | | | 150000 |
| **Total dollars** | | | | | | | 188,539 |

12/5/2005

# TFL #23
# Backlog Program Table
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Legal Obligations** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 274 | 600 | 250 | 250 | 250 | 33.00 | 9042 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 20 | 20 | 20 | 20 | 20 | 500.00 | 10000 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 294 | 620 | 270 | 270 | 270 | 64.77 | 19,042 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 19,042 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 424 | 425 | 425 | 425 | 425 | 33.00 | 13992 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 424 | 425 | 425 | 425 | 425 | 33.00 | 13,992 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total backlog reforestation** | | | | | | | 13,992 |
| **Impeded areas** | | | | | | | |
| Surveys | 2709 | 1700 | 1500 | 1300 | 1300 | 33.00 | 89397 |
| Brushing | 530 | 280 | 120 | 120 | 120 | 520.00 | 275600 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 3239 | 1980 | 1620 | 1420 | 1420 | 112.69 | 364,997 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 364,997 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 0 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 3407 | 2725 | 2175 | 1975 | 1975 | 33.00 | 112431 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 550 | 300 | 140 | 140 | 140 | 519.27 | 285600 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 3957 | 3025 | 2315 | 2115 | 2115 | 100.59 | 398031 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning | | | | | | | 0 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 398,031 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

12/5/2005

**TFL #23**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

## *The following default provincial factors may be replaced by management unit specific factors.*

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| **Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| **Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| **Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area: Tree Improvement | Area: Nursery Seedling Production | Area: Silviculture Surveys |
|---|---|---|---|
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 0 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 0 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 683 |
| Total backlog surveys from the backlog table. | | | 3,407 |
| 33% of all silviculture surveys | | | 1,350 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 1,350 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR) | | | |
| Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | 50 |

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 |

**Years the factor will affect:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| | | |
|---|---|---|
| 5-15% | 15-30% | 1-5% |

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.

The following additional information is needed for tree improvement, seedling production and silviculture surveys

| Area | | |
|---|---|---|
| Tree Improvement | Nursery Seedling Production | Silviculture Surveys |

**A Tree Improvement**

**Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002**

Backlog area planted from backlog table 0

Enter area of all other sites planted with improved trees

Total area affected by tree improvement 0

**B Nursery production of seedlings**

Enter sowing requests from SPAR

**C Silviculture surveys**

Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.

These potentially provide improved estimates of site productivity and operational yield adjustment factors

Total EFP surveys from the EFP table 683

Total backlog surveys from the backlog table. 3,407

33% of all silviculture surveys 1,350

**Optionally, you may provide a more exact estimate:**

Estimate area of regen delay surveys

Estimate area of free growing surveys

Estimate area of pre-stand tending surveys

Estimate of total surveys that will affect timber supply (A) 0

Surveyed area that will affect timber supply

Replace with (A) if a more exact estimate is calculated 1,350

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)

Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 50

Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)

Estimate area that will be classified as free growing after a survey in 2001/2002 2,300

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity.

# TFL #23
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 0 | 0 | 1,350 | 0 | 0 | 550 | 0 | 16 | 0 | 1,916 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 0 | 0 | 40,619 | 0 | 1 | 8,938 | 0 | 0 | 0 | | 49,557 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 50 | | | | | | | | 50 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 2,300 | | | | | | | | 2,300 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 0 | 0 | 135 | 0 | 0 | 1,436 | 0 | 73 | 0 | 192 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 1 | 10 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 16 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# TFL #23
# Management Unit Summary Table
# For the 2001/02 Fiscal Year

|  | Treatment Area Goals (ha) |  |  |  |  | Plan 2001/02 |  |
|---|---|---|---|---|---|---|---|
|  | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 699 | 550 | 550 | 550 | 550 | 44 | 30,539 |
| Planning, prescriptions and seedlings |  |  |  |  |  |  | 158,000 |
| Backlog Program Field Activities | 3,957 | 0 | 0 | 0 | 0 | 101 | 398,031 |
| Planning, prescriptions and seedlings |  |  |  |  |  |  | 0 |
| **Totals** | 4,656 | 550 | 550 | 550 | 550 |  | 586,570 |

**Performance Measures**

|  |  |
|---|---|
| Potential total merchentable volume increment in 65 years | 49,557 $m^3$ |
| Estimated ha that will be reclassified as stocked | 50 ha |
| Estimated ha that will be declared as free growing | 2,300 ha |
| Estimated total full time equivalent positions generated | 10 FTEs |
| Forest health enhancement area | 16 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

## Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement. The template design allows completion in a consistent format for all management units across the province. Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here**: TFL #3

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# TFL #3
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 1 | 0 | 0 | 0 | 0 | 15000.00 | 15000 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 1 | 0 | 0 | 0 | 0 | 14940.24 | 15,000 |
| Planning and prescriptions | | | | | | | 0 |
| **Total dollars** | | | | | | | 15,000 |

## Forest Health Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Habitat Supply and Biodiversity Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Domestic Range

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Enhanced Forestry Activities - Management Unit Total

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 1 | 0 | 0 | 0 | 0 | 14,985.01 | 15,000 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 1 | 0 | 0 | 0 | 0 | 14,866.20 | 15,000 |
| Planning and prescriptions | | | | | | | 0 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 15,000 |

12/5/2005

# TFL #3
## Backlog Program Table
## For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| **Legal Obligations** | | | | | | | |
| Surveys | 100 | 0 | 0 | 0 | 0 | 30.00 | 3000 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 34 | 0 | 0 | 0 | 0 | 550.00 | 18700 |
| Brushing | 168 | 202 | 202 | 202 | 168 | 600.00 | 100800 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 302 | 202 | 202 | 202 | 168 | 405.63 | 122,500 |
| Seed purchase | 21000 | 0 | 0 | 0 | 0 | 0.30 | 6300 |
| **Total legal obligations** | | | | | | | 128,800 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 200 | 200 | 200 | 200 | 200 | 30.00 | 6000 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 44 | 0 | 0 | 0 | 0 | 500.00 | 22000 |
| Brushing | 53 | 53 | 53 | 53 | 44 | 600.00 | 31800 |
| **Totals hectares** | 297 | 253 | 253 | 253 | 244 | 201.35 | 59,800 |
| Seed purchase | 24700 | 0 | 0 | 0 | 0 | 0.30 | 7,410 |
| Prescriptions and planning dollars | | | | | | | 5,000 |
| **Total backlog reforestation** | | | | | | | 72,210 |
| **Impeded areas** | | | | | | | |
| Surveys | 200 | 100 | 100 | 100 | 100 | 35.00 | 7000 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 200 | 100 | 100 | 100 | 100 | 35.00 | 7,000 |
| Prescriptions and planning dollars | | | | | | | 5,000 |
| **Total impeded areas** | | | | | | | 12,000 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 0 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 500 | 300 | 300 | 300 | 300 | 32.00 | 16000 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 78 | 0 | 0 | 0 | 0 | 521.78 | 40700 |
| Brushing | 221 | 255 | 255 | 255 | 212 | 600.00 | 132600 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 799 | 555 | 555 | 555 | 512 | 236.92 | 189300 |
| Seed purchase | 45700 | 0 | 0 | 0 | 0 | 0.30 | 13710 |
| Prescriptions and planning | | | | | | | 10,000 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 213,010 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

12/5/2005

**TFL #3**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

## *The following default provincial factors may be replaced by management unit specific factors.*

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.
**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 |

**Years the factor will affect:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.
**Provincial factors for estimated value gain at harvest**

| | | |
|---|---|---|
| 5-15% | 15-30% | 1-5% |

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.
**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| Area | | |
|---|---|---|
| Tree Improvement | Nursery Seedling Production | Silviculture Surveys |

**A Tree Improvement**
**Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002**

| | |
|---|---|
| Backlog area planted from backlog table | 78 |
| Enter area of all other sites planted with improved trees | |
| Total area affected by tree improvement | 78 |

**B Nursery production of seedlings**
Enter sowing requests from SPAR

**C Silviculture surveys**
Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.
These potentially provide improved estimates of site productivity and operational yield adjustment factors

| | |
|---|---|
| Total EFP surveys from the EFP table | 0 |
| Total backlog surveys from the backlog table. | 500 |
| 33% of all silviculture surveys | 165 |

**Optionally, you may provide a more exact estimate:**

| | |
|---|---|
| Estimate area of regen delay surveys | 100 |
| Estimate area of free growing surveys | 100 |
| Estimate area of pre-stand tending surveys | 0 |
| Estimate of total surveys that will affect timber supply (A) | 200 |

Surveyed area that will affect timber supply
Replace with (A) if a more exact estimate is calculated 165

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)
Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 60

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| **Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| **Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| **Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| Area | | |
|---|---|---|
| Tree Improvement | Nursery Seedling Production | Silviculture Surveys |

A Tree Improvement

**Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002**

Backlog area planted from backlog table 78
Enter area of all other sites planted with improved trees
Total area affected by tree improvement 78

**B Nursery production of seedlings**

Enter sowing requests from SPAR

**C Silviculture surveys**

Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity.
These potentially provide improved estimates of site productivity and operational yield adjustment factors
Total EFP surveys from the EFP table 0
Total backlog surveys from the backlog table 500
33% of all silviculture surveys 165

**Optionally, you may provide a more exact estimate:**

Estimate area of regen delay surveys 100
Estimate area of free growing surveys 100
Estimate area of pre-stand tending surveys 0
Estimate of total surveys that will affect timber supply (A) 200

Surveyed area that will affect timber supply
Replace with (A) if a more exact estimate is calculated 165

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)
Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 60

Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)
Estimate area that will be classified as free growing after a survey in 2001/2002 20

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure
Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity 0

# TFL #3
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 78 | 0 | 165 | 0 | 78 | 221 | 1 | 0 | 0 | 543 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 2,079 | 0 | 4,966 | 0 | 10,647 | 3,591 | 0 | 0 | 0 | | 21,283 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 60 | | | | | | | | 60 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 20 | | | | | | | | 20 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 8 | 0 | 17 | 0 | 156 | 577 | 4 | 0 | 0 | 54 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 5 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# TFL #3
# Management Unit Summary Table
## For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 1 | 0 | 0 | 0 | 0 | 14,866 | 15,000 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| Backlog Program Field Activities | 799 | 0 | 0 | 0 | 0 | 237 | 189,300 |
| Planning, prescriptions and seedlings | | | | | | | 23,710 |
| **Totals** | 800 | 0 | 0 | 0 | 0 | | 228,010 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 21,283 $m^3$ |
| Estimated ha that will be reclassified as stocked | 60 ha |
| Estimated ha that will be declared as free growing | 20 ha |
| Estimated total full time equivalent positions generated | 5 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

## Instructions

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http://www.for.gov.bc.ca/cpp/rmpguidelines/

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a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** TFL #55

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table
are summarized on the spreadsheet "Management Unit Summary."

# TFL #55
# Enhanced Forestry Table:
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |
| **Forest Health Enhancement** | | | | | | | |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Habitat Supply and Biodiversity Enhancement** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Domestic Range** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Enhanced Forestry Activities - Management Unit Total** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |

# TFL #55
# Backlog Program Table:
# For the 2001/02 Fiscal Year

| **Activities** | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| **Legal Obligations** | | | | | | | |
| Surveys | 100 | 0 | 0 | 0 | 0 | 30.00 | 3000 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 40 | 0 | 0 | 0 | 0 | 800.00 | 32000 |
| Brushing | 115 | 0 | 0 | 0 | 0 | 636.00 | 73140 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 255 | 0 | 0 | 0 | 0 | 424.08 | 108,140 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | | 12000 |
| **Total legal obligations** | | | | | | | 120,140 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 200 | 0 | 0 | 0 | 0 | 30.00 | 6000 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | #DIV/0! | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | #DIV/0! | 0 |
| **Totals hectares** | 200 | 0 | 0 | 0 | 0 | 30.00 | 6,000 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | #DIV/0! | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total backlog reforestation** | | | | | | | 6,000 |
| **Impeded areas** | | | | | | | |
| Surveys | 200 | 0 | 0 | 0 | 0 | 30.00 | 6000 |
| Brushing | 20 | 0 | 0 | 0 | 0 | 636.00 | 12720 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 220 | 0 | 0 | 0 | 0 | 85.09 | 18,720 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 18,720 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 0 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 500 | 0 | 0 | 0 | 0 | 30.00 | 15000 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 40 | 0 | 0 | 0 | 0 | 799.96 | 32000 |
| Brushing | 135 | 0 | 0 | 0 | 0 | 636.00 | 85860 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 675 | 0 | 0 | 0 | 0 | 196.83 | 132860 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | | 12000 |
| Prescriptions and planning | | | | | | | 0 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 144,860 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

**TFL #55**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

## *The following default provincial factors may be replaced by management unit specific factors.*

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| 1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)<br>Estimates of annual growth rate increase from each type of treatment over no treatment.<br>**Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| 2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.<br>**Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| 3) Corporate commitment to employment<br>Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.<br>**Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 40 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 40 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 500 |
| 33% of all silviculture surveys | | | 165 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 165 |

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)
Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 40 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 40 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 500 |
| 33% of all silviculture surveys | | | 165 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 165 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR) | | | |
| Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | |
| Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas) | | | |
| Estimate area that will be classified as free growing after a survey in 2001/2002 | | | |

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure
Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity.

# TFL #55
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 40 | 0 | 165 | 0 | 40 | 135 | 0 | 0 | 0 | 380 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 1,066 | 0 | 4,966 | 0 | 5,460 | 2,194 | 0 | 0 | 0 | | 13,686 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 4 | | | | | | | | 4 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 400 | | | | | | | | 400 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 4 | 0 | 17 | 0 | 80 | 352 | 0 | 0 | 0 | 38 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# TFL #55
# Management Unit Summary Table:
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| Backlog Program Field Activities | 675 | 0 | 0 | 0 | 0 | 197 | 132,860 |
| Planning, prescriptions and seedlings | | | | | | | 12,000 |
| **Totals** | 675 | 0 | 0 | 0 | 0 | | 144,860 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 13,686 $m^3$ |
| Estimated ha that will be reclassified as stocked | 4 ha |
| Estimated ha that will be declared as free growing | 400 ha |
| Estimated total full time equivalent positions generated | 3 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

# Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement.
The template design allows completion in a consistent format for all management units across the province.
Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** TFL #56

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# TFL #56
# Enhanced Forestry Table:
# For the 2001/02 Fiscal Year

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 150 | 200 | 200 | 200 | 200 | 30.00 | 4500 |
| Spacing | 0 | 12 | 12 | 12 | 12 | 0.00 | 0 |
| Pruning | 41 | 75 | 75 | 75 | 75 | 1320.27 | 54131 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 191 | 287 | 287 | 287 | 287 | 306.96 | 58,631 |
| Planning and prescriptions | | | | | | | 4,000 |
| **Total dollars** | | | | | | | 62,631 |

## Forest Health Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Habitat Supply and Biodiversity Enhancement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Domestic Range

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |

## Enhanced Forestry Activities - Management Unit Total

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surveys | 150 | 200 | 200 | 200 | 200 | 30.00 | 4,500 |
| Spacing | 0 | 12 | 12 | 12 | 12 | 0.00 | 0 |
| Pruning | 41 | 75 | 75 | 75 | 75 | 1,320.24 | 54,131 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 191 | 287 | 287 | 287 | 287 | 306.96 | 58,631 |
| Planning and prescriptions | | | | | | | 4,000 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 62,631 |

# TFL #56
# Backlog Program Table:
# For the 2001/02 Fiscal Year

| **Activities** | **Treatment Area Goals (ha)** | | | | | **Plan 2001/02** | |
|---|---|---|---|---|---|---|---|
| **Legal Obligations** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 0 |
| **Backlog Reforestation** | | | | | | | |
| Surveys | 1400 | 1480 | 1445 | 1445 | 1445 | 20.71 | 28994 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 4 | 0 | 0 | 0 | 0 | 1,066.67 | 3840 |
| Brushing | 100 | 85 | 54 | 34 | 30 | 444.73 | 44473 |
| **Totals hectares** | 1504 | 1565 | 1499 | 1479 | 1475 | 51.41 | 77,307 |
| Seed purchase | 3600 | 0 | 0 | 0 | 0 | 0.06 | 202 |
| Prescriptions and planning dollars | | | | | | | 15,700 |
| **Total backlog reforestation** | | | | | | | 93,209 |
| **Impeded areas** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 30 | 30 | 30 | 30 | 0.00 | 0 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 30 | 30 | 30 | 30 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total impeded areas** | | | | | | | 0 |
| **Site Restoration** | | | | | | | |
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 0 |
| **Total site restoration** | | | | | | | 0 |
| **Backlog Program Activities - Management Unit Total** | | | | | | | |
| Surveys | 1400 | 1480 | 1445 | 1445 | 1445 | 20.71 | 28994 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 4 | 0 | 0 | 0 | 0 | 1,065.78 | 3840 |
| Brushing | 100 | 115 | 84 | 64 | 60 | 444.72 | 44473 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 1504 | 1595 | 1529 | 1509 | 1505 | 51.41 | 77307 |
| Seed purchase | 3600 | 0 | 0 | 0 | 0 | 0.06 | 202 |
| Prescriptions and planning | | | | | | | 15,700 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 93,209 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

**TFL #56**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

***The following default provincial factors may be replaced by management unit specific factors.***

The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

***Area affected by tree improvement, seedling production and silviculture surveys***

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 4 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 4 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 150 |
| Total backlog surveys from the backlog table. | | | 1,400 |
| 33% of all silviculture surveys | | | 512 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 512 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)<br>Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | |

| Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |

**Years the factor will affect:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Provincial factors for estimated value gain at harvest** | | | | | | 5-15% | 15-30% | 1-5% | |

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 4 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 4 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 150 |
| Total backlog surveys from the backlog table. | | | 1,400 |
| 33% of all silviculture surveys | | | 512 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 512 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)<br>Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | |
| Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)<br>Estimate area that will be classified as free growing after a survey in 2001/2002 | | | |

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity.

# TFL #56
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improvement | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inputs | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 4 | 0 | 512 | 0 | 4 | 100 | 0 | 41 | 0 | 660 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 96 | 0 | 15,394 | 0 | 492 | 1,625 | 0 | 0 | 0 | | 17,606 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 4 | | | | | | | | 4 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 400 | | | | | | | | 400 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 0 | 0 | 51 | 0 | 7 | 261 | 0 | 186 | 0 | 66 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 3 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# TFL #56
# Management Unit Summary Table:
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 191 | 287 | 287 | 287 | 287 | 307 | 58,631 |
| Planning, prescriptions and seedlings | | | | | | | 4,000 |
| Backlog Program Field Activities | 1,504 | 0 | 0 | 0 | 0 | 51 | 77,307 |
| Planning, prescriptions and seedlings | | | | | | | 15,902 |
| **Totals** | 1,695 | 287 | 287 | 287 | 287 | | 155,840 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 17,606 $m^3$ |
| Estimated ha that will be reclassified as stocked | 4 ha |
| Estimated ha that will be declared as free growing | 400 ha |
| Estimated total full time equivalent positions generated | 3 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

## Instructions

Technical instructions are provided in the Guidelines for the Sustainable Harvest Objective found at http://www.for.gov.bc.ca/cpp/rmpguidelines/

This set of tables has and will continue to evolve based on client recommendations for improvement.
The template design allows completion in a consistent format for all management units across the province.
Consistent completion allows tables to be merged to form higher level Sustainable Harvest summaries.

Note that more than one set of tables may be needed for one management unit.
For example, where a management unit extends across districts A and B,
a) Prepare a set of tables for the portion of the Management Unit in district "A".
b) Prepare a second set of tables for the portion of the Management Unit in district "B".
c) Prepare a third set of tables for the overall Management Unit.
Multiple districts that make up a management unit will be summarized by the region.

The name will automatically appear in the heading of the tables:

1) **Type the Management Unit name here:** TFL #8

2) Enter Data into the enhanced forestry table and the backlog program table

3) Make changes to the Input Performance Measures Table
Changes are linked to the Print Performance Measures table to be included with the RMP.

4) Summary Table for Management Unit
The Enhanced Forestry Table, the Backlog Program Table and the Performance Measures Table are summarized on the spreadsheet "Management Unit Summary."

# TFL #8
# Enhanced Forestry Table
# For the 2001/02 Fiscal Year

| **Activities** | **Treatment Area Goals (ha)** | | | | | **Plan 2001/02** | |
|---|---|---|---|---|---|---|---|
| **Stand Tending** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 0 | 150 | 150 | 150 | 150 | 0.00 | 0 |
| Pruning | 0 | 0 | 44 | 6 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 150 | 194 | 156 | 150 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |
| **Forest Health Enhancement** | | | | | | | |
| Spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Pruning | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Habitat Supply and Biodiversity Enhancement** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Domestic Range** | | | | | | | |
| Treatments | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Enhanced Forestry Activities - Management Unit Total** | | | | | | | |
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Spacing | 0 | 150 | 150 | 150 | 150 | 0.00 | 0 |
| Pruning | 0 | 0 | 44 | 6 | 0 | 0.00 | 0 |
| Fertilizing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Other stand tending activities | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 0 | 150 | 194 | 156 | 150 | 0.00 | 0 |
| Planning and prescriptions | | | | | | | 0 |
| **Studies funding** | | | | | | | 0 |
| **Total dollars** | | | | | | | 0 |

# TFL #8
# Backlog Program Table
# For the 2001/02 Fiscal Year

## Activities

### Legal Obligations

| Activities | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/2002 | 2002/2003 | 2003/2004 | 2004/2005 | 2005/2006 | Unit Cost ($/ha) | Funding ($) |
| Surveys | 120 | 190 | 40 | 50 | 190 | 22.00 | 2640 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 38 | 0 | 0 | 0 | 0 | 450.00 | 17100 |
| Brushing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 158 | 190 | 40 | 50 | 190 | 124.93 | 19,740 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Total legal obligations** | | | | | | | 19,740 |

### Backlog Reforestation

| Activities | 2001/2002 | 2002/2003 | 2003/2004 | 2004/2005 | 2005/2006 | Unit Cost ($/ha) | Funding ($) |
|---|---|---|---|---|---|---|---|
| Surveys | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 0 | 50 | 0 | 0 | 0 | 0.00 | 0 |
| Brushing | 0 | 0 | 30 | 30 | 30 | 0.00 | 0 |
| **Totals hectares** | 0 | 50 | 30 | 30 | 30 | 0.00 | 0 |
| Seed purchase | 50000 | 0 | 0 | 0 | 0 | 0.30 | 15,000 |
| Prescriptions and planning dollars | | | | | | | 23,309 |
| **Total backlog reforestation** | | | | | | | 38,309 |

### Impeded areas

| Activities | 2001/2002 | 2002/2003 | 2003/2004 | 2004/2005 | 2005/2006 | Unit Cost ($/ha) | Funding ($) |
|---|---|---|---|---|---|---|---|
| Surveys | 1050 | 520 | 365 | 150 | 150 | 22.00 | 23100 |
| Brushing | 190 | 170 | 50 | 50 | 50 | 650.00 | 123500 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 1240 | 690 | 415 | 200 | 200 | 118.23 | 146,600 |
| Prescriptions and planning dollars | | | | | | | 66,000 |
| **Total impeded areas** | | | | | | | 212,600 |

### Site Restoration

| Activities | 2001/2002 | 2002/2003 | 2003/2004 | 2004/2005 | 2005/2006 | Unit Cost ($/ha) | Funding ($) |
|---|---|---|---|---|---|---|---|
| Fill planting | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Rehabilitation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Reforestation | 5 | 0 | 0 | 0 | 0 | 600.00 | 3000 |
| **Totals hectares** | 5 | 0 | 0 | 0 | 0 | 599.76 | 3,000 |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Prescriptions and planning dollars | | | | | | | 1,000 |
| **Total site restoration** | | | | | | | 4,000 |

### Backlog Program Activities - Management Unit Total

| Activities | 2001/2002 | 2002/2003 | 2003/2004 | 2004/2005 | 2005/2006 | Unit Cost ($/ha) | Funding ($) |
|---|---|---|---|---|---|---|---|
| Surveys | 1170 | 710 | 405 | 200 | 340 | 22.00 | 25740 |
| Site preparation | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| Planting | 43 | 50 | 0 | 0 | 0 | 467.43 | 20100 |
| Brushing | 190 | 170 | 80 | 80 | 80 | 649.99 | 123500 |
| Density spacing | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 |
| **Totals hectares** | 1403 | 930 | 485 | 280 | 420 | 120.70 | 169340 |
| Seed purchase | 50000 | 0 | 0 | 0 | 0 | 0.30 | 15000 |
| Prescriptions and planning | | | | | | | 90,309 |
| **Recommended studies** | | | | | | | 0 |
| **Total backlog program** | | | | | | | 274,649 |

* Seed purchase includes seedlings purchase. Units are number of seedlings, or specify.

**TFL #8**
**Instructions for developing the Performance Measures Table for FRBC Investments**
**For the 2001/02 Fiscal Year**

This spreadsheet allows for calculation of key performance measures for activities under the Sustainable Harvest Objective.
FRBC requires completion of the Performance Measures Table to illustrate the impact of funding the proposed activities in this RMP.
For more information on how to use more management unit specific factors contact Frank Barber (250) 387-8906.
**Entries needed are in red**

Related Goal: Silviculture investment decisions will be guided by forest-level stewardship plans in 100 per cent of management units.
Please replace the following linked table title with the type of stewardship plan that guided the creation of this RMP:
**Based on (Type 1, Type 2 silviculture strategy or specify if other)**

***The following default provincial factors may be replaced by management unit specific factors.***
The following factors are used to generate the table. **Please replace these factors with localized factors where available.**

| | Tree Improvement | Nursery Seedling Production | Silviculture Surveys | Site Preparation | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin |
|---|---|---|---|---|---|---|---|---|---|---|
| **Potential volume/ha gain (m3/ha/yr) provincial factors:** | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | |
| **Years the factor will affect:** | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | |
| **Provincial factors for estimated value gain at harvest** | | | | | | | 5-15% | 15-30% | 1-5% | |
| **Est. short term employment rate (person days/ha) provincial factors:** | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)
Estimates of annual growth rate increase from each type of treatment over no treatment.

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

3) Corporate commitment to employment
Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

***Area affected by tree improvement, seedling production and silviculture surveys***
Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | **Tree Improvement** | **Nursery Seedling Production** | **Silviculture Surveys** |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 43 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 43 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 114,300 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 1,170 |
| 33% of all silviculture surveys | | | 386 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 386 |

Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)
Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 100

| ment | Production | | | | | | | | admin |
|---|---|---|---|---|---|---|---|---|---|

1) Related goal: Over the next five years, Forest Renewal BC's investments to improve timber volume will increase the timber available for potential future harvest by 25 million cubic metres. (m3/ha/yr times ha times years gives m3)

Estimates of annual growth rate increase from each type of treatment over no treatment.

**Potential volume/ha gain (m3/ha/yr) provincial factors:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 |

**Years the factor will affect:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |

2) Related goal: The economic value of timber on all enhanced forestry treatment areas will be increased by between 5% and 30%.

**Provincial factors for estimated value gain at harvest**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 5-15% | 15-30% | 1-5% |

3) Corporate commitment to employment

Enter an estimate for each activity of the number of 8 hour person days that are required to complete the activity per hectare.

**Est. short term employment rate (person days/ha) provincial factors:**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 |

## *Area affected by tree improvement, seedling production and silviculture surveys*

Most of the information required to calculate performance measures is from links to the enhanced forestry and backlog tables.
The following additional information is needed for tree improvement, seedling production and silviculture surveys

| | Area | | |
|---|---|---|---|
| | **Tree Improvement** | **Nursery Seedling Production** | **Silviculture Surveys** |
| **A Tree Improvement** | | | |
| **Estimate of the total number of hectares that will be planted with genetically improved seed, all funding sources, in 2001/2002** | | | |
| Backlog area planted from backlog table | 43 | | |
| Enter area of all other sites planted with improved trees | | | |
| Total area affected by tree improvement | 43 | | |
| **B Nursery production of seedlings** | | | |
| Enter sowing requests from SPAR | | 114,300 | |
| **C Silviculture surveys** | | | |
| Provincially, it is estimated that 33% of all silviculture surveys are for stocking and site productivity. | | | |
| These potentially provide improved estimates of site productivity and operational yield adjustment factors | | | |
| Total EFP surveys from the EFP table | | | 0 |
| Total backlog surveys from the backlog table. | | | 1,170 |
| 33% of all silviculture surveys | | | 386 |
| **Optionally, you may provide a more exact estimate:** | | | |
| Estimate area of regen delay surveys | | | |
| Estimate area of free growing surveys | | | |
| Estimate area of pre-stand tending surveys | | | |
| Estimate of total surveys that will affect timber supply | | (A) | 0 |
| Surveyed area that will affect timber supply<br>Replace with (A) if a more exact estimate is calculated | | | 386 |
| Related goal: 25,000 hectares will be added back to the commercial forest base through surveys and planting (backlog NSR)<br>Estimated area that was NSR projected to be reclassified as SR after survey in 2001/2002 | | | 100 |
| Related goal: 125,000 hectares of previously planted land will be brought to free growing status (impeded areas)<br>Estimate area that will be classified as free growing after a survey in 2001/2002 | | | 200 |

**Habitat Supply**

Melp staff professional judgement used to estimate this performance measure

| | |
|---|---|
| Area where additional value provided to habitat/biodiversity resulting from enhanced forestry activity. | |

# TFL #8
## Performance Measures Based on Activities Planned for 2001/2002
## Based on (Type 1, Type 2 silviculture strategy or specify if other)

| | Performance Measure | Tree Improve-ment | Nursery Seedling Production | Silv. Survey | Site prep. | Backlog Plant | Brush | Space | Prune | Fertilize | Support staff and admin | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Inputs** | | | | | | | | | | | |
| A | **Planned treatment area (ha) in 2001/2002** | 43 | 114,300 | 386 | 0 | 43 | 190 | 0 | 0 | 0 | 114,962 | |
| 1.0 | **Timber Supply** | | | | | | | | | | | |
| 1.1 | Potential volume/ha gain (m3/ha/yr) | 0.41 | 0 | 0.463 | 0 | 2.1 | 0.25 | 0 | 0 | 0.31 | | |
| 1.2 | Years the factor will apply | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | |
| 1.3 | Pot. total merch. volume increment in 65 years (m3) | 1,146 | 0 | 11,620 | 0 | 5,870 | 3,088 | 0 | 0 | 0 | | 21,723 |
| 1.4 | Est. yrs reduced to achieve management objectives | 5-10 | 1-3 | 5-10 | 0 | 5-20 | 5 | 5-30 | 0 | 5-10 | | |
| 1.4 | Est. area that will be reclassified as stocked (ha) | | | 100 | | | | | | | | 100 |
| 1.5 | Est. area that will be declared as free growing (ha) | | | 200 | | | | | | | | 200 |
| 2.0 | **Wood Value** | | | | | | | | | | | |
| 2.1 | Percent improvement in total value at harvest (Compared to no treatment) | | | | | | | 5-15% | 15-30% | 1-5% | | |
| 3.0 | **Employment** | | | | | | | | | | | |
| 3.1 | Estimated short term employment (person days/ha) | 0.1 | 0.34 | 0.1 | 1 | 2 | 2.61 | 3.96 | 4.54 | 0.18 | 0.1 | |
| 3.2 | Estimated total employment (person days/year) | 4 | 38,862 | 39 | 0 | 86 | 496 | 0 | 0 | 0 | 11,496 | |
| 3.3 | Estimated total full time equivalent positions (FTE) | 0 | 216 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 64 | 283 |
| 4.1 | **Forest Health Enhancement (ha)** | | | | | | | | | | | 0 |
| 5.1 | **Habitat Supply** | | | | | | | | | | | |
| 5.2 | Planned area for specific wildlife forage or habitat creation in 2001/2002 (ha) | | | | | | | | | | | 0 |
| 5.3 | Est. area with secondary value provided to biodiversity (ha) | | | | | | | | | | | 0 |

# TFL #8
# Management Unit Summary Table
# For the 2001/02 Fiscal Year

| | Treatment Area Goals (ha) | | | | | Plan 2001/02 | |
|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($/ha) | Funding ($) |
| Enhanced Forestry Program Field Activities | 0 | 150 | 194 | 156 | 150 | 0 | 0 |
| Planning, prescriptions and seedlings | | | | | | | 0 |
| Backlog Program Field Activities | 1,403 | 0 | 0 | 0 | 0 | 121 | 169,340 |
| Planning, prescriptions and seedlings | | | | | | | 105,309 |
| **Totals** | 1,403 | 150 | 194 | 156 | 150 | | 274,649 |

**Performance Measures**

| | |
|---|---|
| Potential total merchentable volume increment in 65 years | 21,723 $m^3$ |
| Estimated ha that will be reclassified as stocked | 100 ha |
| Estimated ha that will be declared as free growing | 200 ha |
| Estimated total full time equivalent positions generated | 283 FTEs |
| Forest health enhancement area | 0 ha |
| Planned area for specific wildlife forage or habitat creation | 0 ha |
| Estimated area with secondary value provided to biodiversity | 0 ha |

# Type 1
# Incremental Silviculture Analysis
# for TFL 8

*Prepared for*
*Boundary Timber Division*
*Pope & Talbot Ltd.*
*Midway, BC*

Project: PTM-051-010

Version 2
August 4, 2000

This report contains confidential information that may not be used for any purpose other than the project addressed herein. This report may not be disclosed to any other person, organization, or representative without the express consent of J.S. Thrower & Associates Ltd.

***J.S. Thrower & Associates Ltd.*** *Consulting Foresters*
*Vancouver – Kamloops – Victoria BC*

## Executive Summary

The Type 1 Incremental Silviculture Analysis was undertaken to provide background for the development of a silviculture strategy for TFL 8. A complete silviculture strategy will provide a rational framework for silviculture expenditures on the TFL.

The purpose of the Type 1 Incremental Silviculture Analysis was:

- to review the most recent timber supply analysis for TFL 8.
- to identify issues that might be addressed through silvicultural treatments.
- to estimate the potential impacts on timber supply of the application of incremental silviculture treatments.

The outcome of the Type 1 Analysis is summarized as an interim incremental silviculture strategy. The analysis shows that Pope and Talbot has recognized the main issues and no major changes in silviculture strategy are required. The key recommendations are:

1. Use genetically improved stock as much as possible.
2. Emphasize full site occupancy in silviculture regimes.
3. Encourage the establishment and development of mixed-species stands.
4. Evaluate the potential for fertilization.
5. Look for opportunities to prune legacy stands.

## Acknowledgements

J.S. Thrower and Associates gratefully acknowledge the contributions of the staff of Pope and Talbot's Boundary Timber Division and the additional input from Ministry of Forests staff who participated in the workshop.

## Table of Contents

1. INTRODUCTION ....4
*1.1 BACKGROUND* ....4
*1.2 DEFINITIONS* ....4
2. OVERVIEW OF THE LAND BASE AND FOREST COVER ....6
3. REVIEW OF THE TIMBER SUPPLY ANALYSIS ....8
*3.1 BASE CASE HARVEST FORECAST* ....8
*3.2 SENSITIVITY ANALYSIS* ....8
*3.3 REVISED BASE CASE* ....9
4. POTENTIAL EFFECTS OF INCREMENTAL SILVICULTURE ....10
*4.1 TIMBER SUPPLY* ....10
4.1.1 Regenerated Stand Yields ....10
4.1.2 Minimum Harvest Age ....14
*4.2 WOOD QUALITY* ....16
4.2.1 Current Products and Markets ....16
4.2.2 Product Vision to 2020 ....16
4.2.3 Silviculture and Wood Quality ....17
*4.3 WILDLIFE HABITAT* ....18
*4.4 INSECT AND DISEASE PESTS* ....18
4.4.1 Insect and Disease Issues ....18
4.4.2 Forest Pests and Silviculture ....19
5. INTERIM INCREMENTAL SILVICULTURE STRATEGY ....20
6. LITERATURE CITED ....22
7. APPENDIX I INCREMENTAL SILVICULTURE ACTIVITIES ....23
*7.1 PRE 1987 OVERVIEW* ....23
*7.2 SUMMARY OF PAST INCREMENTAL SILVICULTURE ACTIVITIES* ....24
*7.3 CURRENT INCREMENTAL SILVICULTURE PROGRAM PLAN* ....24
*7.4 PRE 1987 NSR PLANS* ....25
*7.5 POTENTIAL INCREMENTAL SILVICULTURE TREATMENTS* ....25
8. APPENDIX II WORKSHOP SUMMARY ....26
*8.1 WORKSHOP OVERVIEW* ....26
*8.2 ISSUES IDENTIFIED* ....26

## List of Tables

Table 1. Area of landbase. ....6
Table 2. Sensitivity analysis of base case harvest flow. ....9
Table 3. Seedlings planted 1997-99. ....12
Table 4. Effects of juvenile spacing on various definitions of minimum harvest age ....15
Table 5. Comparison of points C and B from Figure 7. ....15
Table 6. Overview of stands logged prior to 1987. ....23
Table 7. Incremental silviculture treatment area by year ....24
Table 8. Current 5-year incremental silviculture program plan (area). ....24

Table 9. Plans for treatment of pre-1987 NSR areas. 25
Table 10. Summary of potential incremental 25
Table 11. List of workshop attendees. 26

## List of Figures

Figure 1. Area distribution by BEC zone. 6
Figure 2. Area distribution by species, age class and mixture type. 7
Figure 3. Base case harvest flow from MP 9 Timber Supply Analysis. 8
Figure 4. Revised base case with predicted impact of potential site index. 9
Figure 5. Genetic gain in volume and height. 11
Figure 6. Impact of juvenile spacing 13
Figure 7. Harvest ages based on mean DBH. 15

# 1. INTRODUCTION

## 1.1 BACKGROUND

The Ministry of Forests and Forest Renewal BC are promoting and funding the development of incremental silviculture strategies for every Timber Supply Area and Tree Farm Licence in B.C. A strategy for incremental silviculture is a high-level planning initiative that emphasizes the broad implications of different options rather than the details of individual silviculture prescriptions. The purpose of an incremental silviculture strategy is to provide a rational framework for silviculture expenditures aimed at improving the future quantity and quality of both timber and wildlife habitat.

Three types of analysis will contribute to an incremental silvicultural strategy. A *Type 1 Analysis* uses information from the most recent timber supply analysis to identify issues that might be addressed through silvicultural treatments and then infer or speculate on the potential impacts. A *Type 2 Analysis* involves a new forest-level analysis that evaluates the timber supply consequences of alternative silviculture strategies. It identifies feasible strategies and the level of funding required to implement them. A *Type 3 Analysis* explores new approaches to the modelling of wildlife habitat and environmental (non-timber) values for eventual incorporation into a Type 2 Analysis. This report involves the Type 1 analysis for TFL 8.

## 1.2 DEFINITIONS

Silviculture is "the art of producing and tending a forest" (Smith *et al.*, 1997) and involves the planned application of treatments that will influence the "establishment, growth, composition, and quality of forest vegetation" (Daniel *et al.*, 1979). The complete program of activities planned through the life of the stand is a **silvicultural system** (Smith *et al.*, 1997).

It is customary to categorize silvicultural treatments as either basic or intensive. **Basic silviculture** treatments are those that facilitate the establishment of a stand.[1] **Intensive silviculture** describes practices such as thinning, fertilization and genetic improvement that "increase the capability of the forest to produce fiber' (Franzese *et al.*, 1978).

In British Columbia, the categorization of treatments is based on the regulatory context in which they are applied. **Basic silviculture** is therefore defined as "harvesting methods and silviculture operations ... that are for the purpose of establishing a free growing crop of trees of a commercially valuable species and are required in a regulation, pre-harvest silviculture prescription or silviculture prescription."[2] **Incremental Silviculture** is a Ministry of Forests term that refers the application of silvicultural treatments in addition to mandatory silviculture required by law. Under this definition, incremental silviculture extends beyond the traditional activities of spacing, pruning and fertilization. It also includes pre-free growing silviculture activities that are in excess of legal requirements, as well as commercial thinning and backlog reforestation. This means that a particular silvicultural treatment, such as pruning, could be regarded as either basic or incremental depending upon the regulatory situation under which it was applied.

---

[1] The State of Canada's Forests. 1999. Natural Resources Canada, Canadian Forest Service, Ottawa.

[2] Glossary of Forest Terms. British Columbia Ministry of Forests (undated).

## 2. OVERVIEW OF THE LAND BASE AND FOREST COVER

TFL 8 consists of two geographically distinct units that were originally separate TFLs. Block 1 (Boundary Block), originally awarded as TFL 8, is situated in the Boundary Creek area north of Greenwood. Block 2 (Carmi Block), covering the Trapping Creek and Carmi Creek drainages north of Beaverdell, was originally awarded as TFL 11. Pope and Talbot has been the license holder of the combined areas since 1969, when the two TFLs were amalgamated as TFL 8.

The total area of the TFL is 77,665 ha, of which approximately 82% is considered the net timber harvesting landbase (Table 1). The TFL is distributed across five biogeoclimatic zones, with slightly more than 50% of the Montane Spruce zone (Figure 1).

Table 1. Area of landbase.

| Description | Area (ha) | % |
|---|---|---|
| Total Area of TFL | 77,664 | 100 |
| Total Productive Forest | 74,239 | 96 |
| Net Timber Harvesting Landbase | 63,480 | 82 |

The main species on TFL 8 are Douglas-fir (Fd), lodgepole pine (Pl) and western larch (Lw). Stands with Pl as the leading species occupy the most area (Figure 2a), but Fd stands have the highest proportion of the volume(Figure 2b). This observation reflects a difference in age distribution rather than a large gap in productivity. Approximately 70% of the Pl stands stands are in age classes 1-4 (0-80 years). In contrast, about 70% of the Fd stands are age classes 8 and 9 (140 years and older). Overall , the age class distribution shows that nearly 50% of the TFL is older than 140 years (age classes 7-9) (Figure 2c).

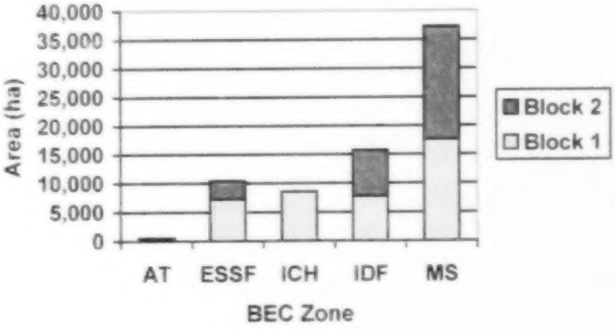

Figure 1. Area distribution by BEC zone.

Mixed-species stands are prominent on TFL 8 in all subzones (Figure 2d). More than one-half of the area qualifies as a mixed-species stands with less than 80% of the volume in any single species. In the MS and IDF zones, stands are generally some combination of Fd, Pl and Lw.

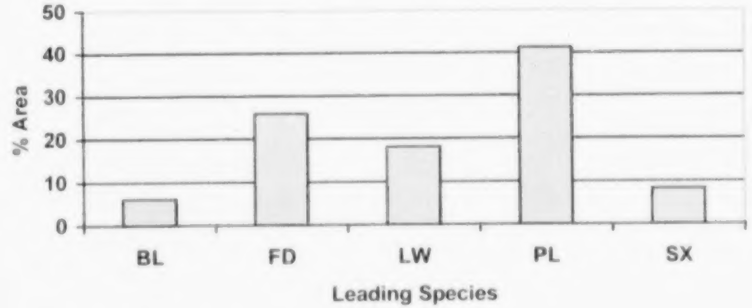

Figure 2a. Species distribution by area.

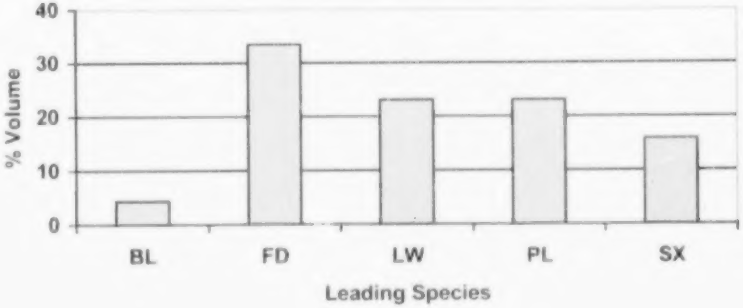

Figure 2b. Species distribution by volume.

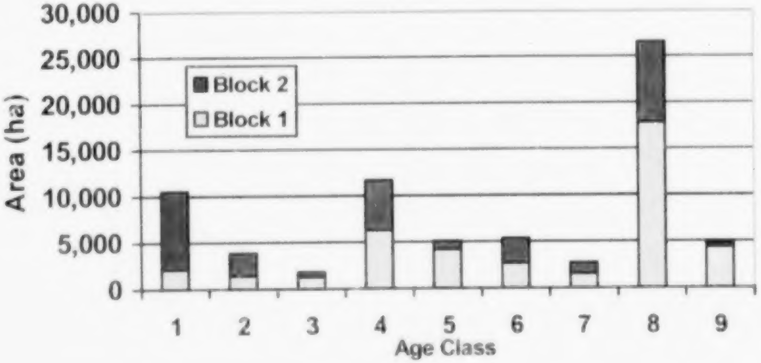

Figure 2c. Age distribution by TFL block.

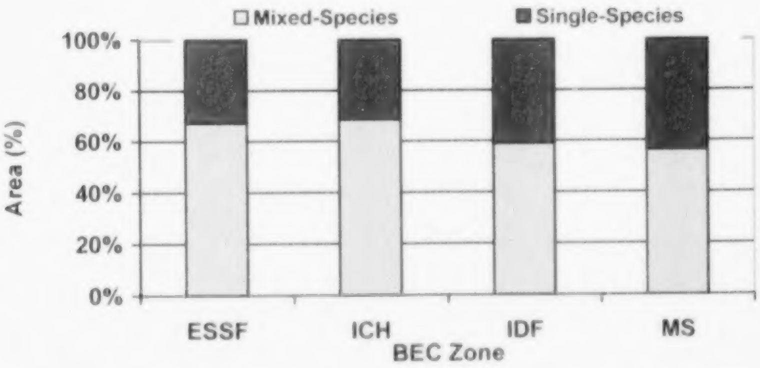

Figure 2d. Distribution of mixed-and single-species stands by BEC zone

## 3. REVIEW OF THE TIMBER SUPPLY ANALYSIS

The most recent timber supply analysis for TFL 8 is the analysis completed in 1997 by Sterling Wood Group Inc. in support of Management Plan 9 (MP 9). Preparations for the next analysis, due in 2001, are already underway. There will be new information and some different assumptions used for the next analysis which may bring a different perspective to many of the issues discussed in this report.

### 3.1 BASE CASE HARVEST FORECAST

The current Allowable Annual Cut (AAC) for TFL 8 is 145,000 m$^3$, which remains unchanged from the previous AAC. Under the assumptions of MP 9, the timber supply analysis forecasts that the harvest will be maintained at 145,000m$^3$ for four decades, step down to 132,000m$^3$ at the beginning of the fifth decade and level out at 128,000m$^3$ from the beginning of the sixth decade and onward (Figure 3).

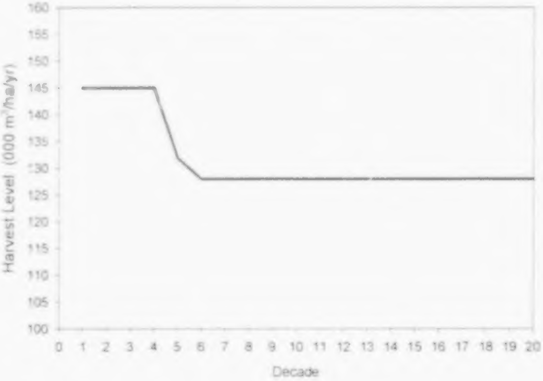

Figure 3. Base case harvest flow from MP 9 Timber Supply Analysis.

### 3.2 SENSITIVITY ANALYSIS

A sensitivity analysis shows how changes in the input assumptions affect the harvest flow. The timber supply analysis for MP 9 was conducted within an "even-flow" framework rather than the "step-down" approach used by the Ministry of Forests. This means that it can be difficult to determine which factors most restrict the harvest flow at different points in time. Furthermore, we cannot be certain that level of sensitivity observed in the even-flow sensitivity analysis would be equivalent under the step-down method. The few scenarios run under both approaches, however, show approximately the same level of sensitivity.

The sensitivity of the base case to the changes in selected inputs are summarize in Table 2. The base case is highly sensitive to changes in the yield predictions for regenerated stands, and changes in the timber harvesting landbase. Moreover, the effect of positive change is approximately the same as a negative change. Other input variables have more complicated effects on the harvest volume. Increasing the minimum harvest age by 10 years, for example, will lower the harvest rate by 3.9%, but a 10-year decrease has no effect.

### 3.3 REVISED BASE CASE

Table 2. Sensitivity analysis of base case harvest flow.

| Input | Input Change | Harvest Change |
|---|---|---|
| Existing Stand | -10 % | 0.8 % |
| Yields | +10 % | ↑ 1.6 % |
| Regenerated | -10 % | 10.2 % |
| Stand Yields | +10 % | ↑ 9.4 % |
| Minimum | -10 years | - 0.0 % |
| Harvest Age | +10 years | 3.9 % |
| Minimum | -25 m$^3$/ha | 1.6 % |
| Harvest Volume | +25 m$^3$/ha | 3.1 % |
| Green Up | -2 m | ↑ 3.1 % |
| | +2 m | 7.0 % |
| Timber Harvest | -10 % | 10.9 % |
| Land Base | +10 % | ↑ 11.7 % |

A Type 1 Incremental Silviculture Analysis involves close scrutiny of the base case and the sensitivity analysis. One of the most sensitive inputs to the base case – site productivity – is a primary concern on TFL 8. In the rationale statement[3] for the last timber supply analysis, the Chief Forester suggested that site index was probably underestimated in older stands, and that opinion was echoed in the growth and yield strategy (J.S. Thrower and Associates, 1999a). In a timber supply analysis, the site index estimates from the older stands would be used to predict the growth of the young stands established after logging. The effect is potentially so powerful that we have chosen to estimate it's effect on the base case harvest flow and produce a revised base case before we proceed with any discussion of silviculture options.

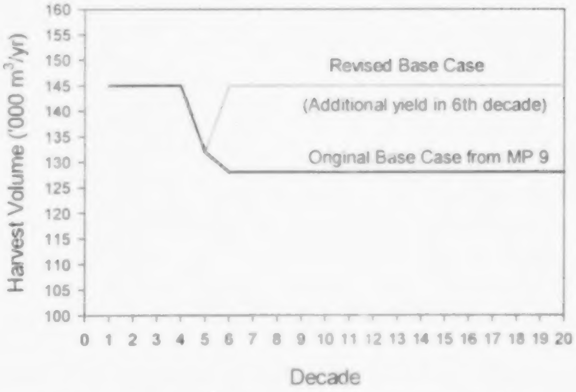

Figure 4. Revised base case with predicted impact of potential site index.

A comparison of the inventory estimates of site index with new estimates of the potential site index (J.S. Thrower and Associates, 2000a) suggested that the area-weighted average site index is underestimated by more than 1 metre. Using TIPSY estimates of yield for lodgepole pine as a benchmark, a 1-metre increase in site index translates into a 14% increase in yield. According to the sensitivity analysis in MP 9, a 14% increase in the yield curves for regenerated stands is likely to produce a 13% increase in the harvest level.

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[3] Ministry of Forests. 1997. Tree Farm Licence 8: Rationale for allowable annual cut (AAC) determination. L. Pedersen, Chief Forester

The key point is predicting when the increase in the harvest flow will occur. It seems safe to assume the stands established over the past 25 years are growing at the potential site index and could possibly be harvested at the beginning of the 6th decade. In this case the harvest flow would show only a slight dip to 132,000 $m^3$/yr in the 5th decade, followed by a return to 145,000 $m^3$/yr thereafter (Figure 4). Alternatively, if enough of the managed stands are available a decade earlier (i.e, beginning of the 5th decade), then there would be no decrease in the harvest level. In the first case, a silviculture strategy might then focus on silviculture treatments that might ameliorate the drop in harvest in the 5th decade. In the second case, the silviculture strategy would aim for a general increase in harvest flow. The next timber supply analysis—to be conducted with new information, new assumptions and a spatial timber supply model—will offer a better assessment of this situation.

## 4. POTENTIAL EFFECTS OF INCREMENTAL SILVICULTURE

### 4.1 TIMBER SUPPLY

The projected harvest flow, as modelled in a timber supply analysis, could be increased beyond the levels observed in the base case through any of the following steps:

1. Increasing the landbase available for growing timber.
2. Identifying and correcting any underestimation of the standing inventory.
3. Identifying and correcting any underestimation of site productivity.
4. Increasing the level of utilization.
5. Enhancing the yield of regenerated stands.
6. Meeting regulatory requirements sooner (e.g., adjacency constraints).
7. Redefining critical timber supply assumptions (e.g., minimum harvest age).

Incremental silviculture treatments can play a role in items 5, 6 and 7, as discussed in the following sections.

#### *4.1.1 Regenerated Stand Yields*

The key to enhancing the yield of regenerated stands is to capture as much as possible of the potential productivity of each site. Basic silviculture practices deserve most of the credit for impressive gains already achieved through reduced regeneration delay and enhanced site occupancy. The opportunities for further increases are somewhat limited because site resources are essentially fixed (Ministry of Forests, 1999). We can add to the pool of site resources with fertilization or enhance the efficiency of use by planting improved stock. We can also effectively increase yields by reducing losses to pests and by avoiding treatments that can impair site occupancy.

#### *4.1.1.1 Fertilization*

Fertilization is one of the few treatments that will increase the biological yield of forest stands. The fertilization routine in TIPSY Version 2.5 suggests that for a typical Pl plantation on the mesic site series in TFL 8's IDF or MS subzones (initial density=1600, site index=21m), a single application will add 12m$^3$/ha over a ten-year response period. That amount translates to a 9.5% increase in growth rate in the response period, and an overall 3% increase in stand yield at rotation.

At the forest level, the impact of fertilization on the harvest flow would depend on the proportion of stands that were fertilized. A general 3% increase in the harvest flow would result only if every regenerated stand were fertilized and only if each attained the predicted response.

Fertilization could be used to target the potential drop of 13,000 m$^3$/yr in the 5th decade, as shown earlier in one of the revised base case alternatives. This would require fertilization of approximately 11,000 ha before the 4th decade. There are too few stands currently in age classes 2 and 3 (ages 20 to 60years) to support this level of fertilization without multiple applications to each stand. As noted earlier, this context may change in the new timber supply analysis; the merits of fertilization should be revisited after the analysis is completed.

#### *4.1.1.2 Genetic Gain*

Genetic gain can now be incorporated into timber supply analysis. Yield gains from improved stock are derived from more efficient use of site resources. TIPSY 2.5. predicts the yield gains from tree improvement based on values of genetic worth. Application of the default values for lodgepole pine produces the gains observed in Figure 5. The predicted gain in merchantable volume at 60 years is approximately 8.5%, diminishing to less than 3% by 120 years.

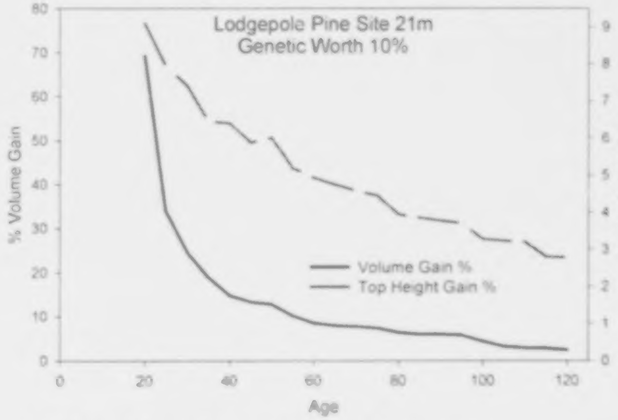

Figure 5. Genetic gain in volume and height.

The effect of tree improvement on harvest flow depends on the proportion of improved seed used in annual plantings. Currently, Class A seed makes up 100% of Pope and Talbot's spruce planting stock, 30% of the lodgepole pine stock and 10% of the larch stock. Based on the number of seedlings planted in the last three years (Table 3), proportion of improved seed being used is about 45% overall. Although demand for improved stock will continue to outstrip supply for several years, Pope and Talbot expects to increase the proportion of their planting stock derived from improved seed. Tree improvement appears to be one of the best options for obtaining meaningful and feasible increases in yield at the stand and forest level

Table 3. Seedlings planted 1997-99.

| Species | Number | Percent |
|---|---|---|
| Bl | 7,650 | 0.5 |
| Fd | 8,520 | 0.5 |
| Lw | 258,020 | 16.5 |
| Pl | 855,090 | 54.5 |
| Pw | 500 | 0.0 |
| Py | 20,155 | 1.3 |
| Sx | 417,770 | 26.6 |
| Totals | 1,567,705 | 100.0 |

#### *4.1.1.3 Juvenile Spacing*

Juvenile spacing is a pre-commercial thinning that removes selected trees to provide additional growing space for the residual trees. Juvenile spacing reduces the occupancy of growing space by an amount that depends on the number of trees removed. Over time the residual stand will re-occupy some or all of the additional growing space created by the thinning (Ministry of Forests, 1999). The loss of occupancy, albeit temporary for light thinnings, translates into a loss in biomass production that will not be recovered (Figure 6a). If we apply utilization standards (10cm top, 30cm stump) and merchantability limits (minimum DBH), then some of the regimes with higher residual densities (1600 per ha and higher) will show modest gains in merchantable volume (4% to 6%) over what is predicted for unthinned natural stands established at about 10,000 stems per ha (Figure 6b).

A notable exception is in the repression of height growth observed in fire-origin stands of lodgepole pine that germinate at densities in excess of 15,000 stems per ha. Early thinning of these dense stands will allow them to reach their productive potential and avoid losses of 10-30% as densities increase from 50,000 per ha to 250,000 per ha. These high density stands are spaced as part of the basic silviculture obligations.

In the timber supply context, merchantable volume is the most relevant yield statistic. Harvest flows and the allowable annual cut are both expressed as merchantable volume without respect to species or product value. Those considerations are addressed in other forms of management planning.

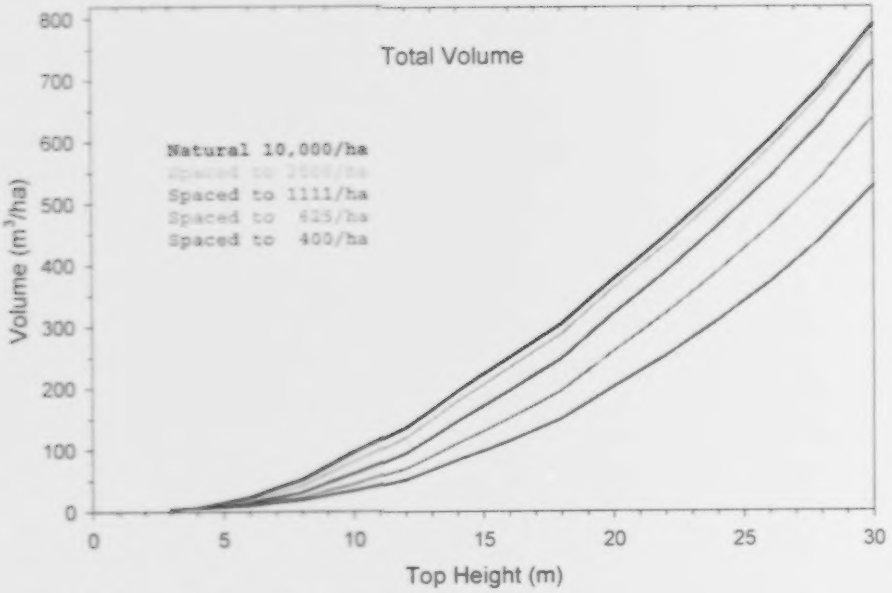

Figure 6a. Impact of juvenile spacing on total volume.

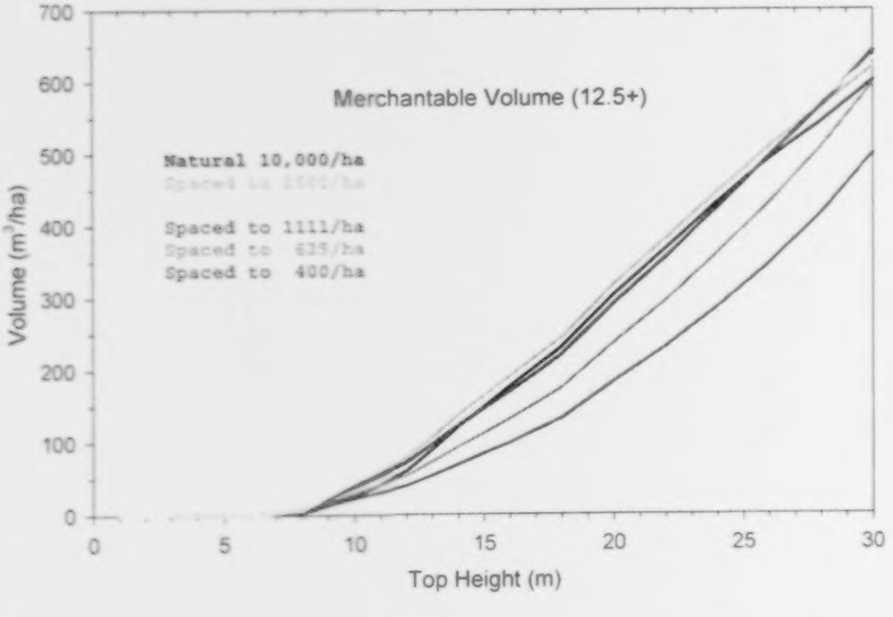

Figure 6b. Impact of juvenile spacing on merchantable volume (12.5cm+).

Pope and Talbot recognizes the importance of maintaining full site occupancy and normally prescribes 200-400 stems per ha more that the MOF target standards for planting density and 600 stems per ha more than the targets for residual spacing density. This strategy could be further enhanced by minimizing all unnecessary or discretionary juvenile spacing when there are no other compelling reasons for spacing.

### *4.1.2 Minimum Harvest Age*

The minimum harvest age specified for each analysis unit in the timber supply analysis indicates the earliest age at which stands can be harvested. In many TFLs and TSAs, the projections of the harvest flow can be very sensitive to the minimum harvest age, especially at the point where the emphasis in harvesting must switch from the mature natural forest to second growth. Lowering the minimum harvest age – even just temporarily – can sometimes help bridge the gap until the bulk of the managed stands reach merchantability. However, an ongoing policy of harvesting at the minimum possible age would severely impair long term harvest levels if the minimum harvest age is substantially earlier than the culmination of mean annual increment.

There are no firm guidelines for assigning minimum harvest age. It was once customary to use the culmination age of mean annual increment. In the previous timber supply analysis for TFL 8, the minimum harvest age was set to the age when stands reached a volume of 175 $m^3$ per ha.

Silvicultural treatments that enhance yield , such as planting genetically improved stock or applying fertilizer, will also tend to reduce the minimum harvest age. The magnitude of the effect, however, is often small. For lodgepole pine on site 21m, a single application of fertilizer will reduce the harvest age by about 2 years, while a 10% increase in genetic worth will reduce the harvest age approximately 5 years. Whether those reductions are sufficient to relieve some timber supply constraints will depend on the particulars of the management unit and the analysis.

Recently there have been suggestions that juvenile spacing should be prescribed explicitly to reduce minimum harvest age in timber supply analysis. Yield predictions from TIPSY 2.1 (Table 4) show that this approach would not reduce the minimum harvest age if it was defined by culmination of mean annual increment or a minimum volume. Under those assumptions, juvenile spacing would actually increase the minimum harvest age. Reductions in harvest age would only occur if they were based on some measure of stand diameter, such as mean stand DBH or the mean DBH of prime trees (largest 250 per ha). The example below, however, demonstrates that thinning introduces an artificial increase to the mean DBH statistic that does not reflect the real changes in tree size. This point is expanded in more detail in the Guidelines for Developing Stand Density Management Regimes (Ministry of Forests, 1999).

Table 4. Effects of juvenile spacing on various definitions of minimum harvest age.

| | | Residual Juvenile Spacing Density | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PCT Density | No PCT | 4444 | 2500 | 1600 | 1111 | 816 | 625 | 493 | 400 |
| Square Spacing | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 |
| Mean Annual Incr. | 5.7 | 5.8 | 5.9 | 6.0 | 5.6 | 5.4 | 4.8 | 4.4 | 3.9 |
| Culmination Age | 70 | 66 | 59 | 70 | 75 | 80 | 83 | 85 | 94 |
| Age at 175m$^3$/ha | 42 | 41 | 40 | 40 | 42 | 44 | 48 | 50 | 54 |
| Age at 25cm DBH | 100 | 98 | 85 | 79 | 60 | 49 | 43 | 40 | 39 |
| Age at 25cm Prime | 52 | 52 | 47 | 44 | 39 | 37 | 36 | 35 | 35 |

If stands are spaced, they will attain a specified DBH sooner than if they had not been spaced. As shown in Figure 7, the unspaced natural stand reaches 25cm DBH near age 100 (A) while the stand spaced to 1111 per ha reaches the same mean DBH at 60 years (B). A reduction in minimum harvest age of this magnitude could have a dramatic positive impact on harvest flow in a timber supply analysis.

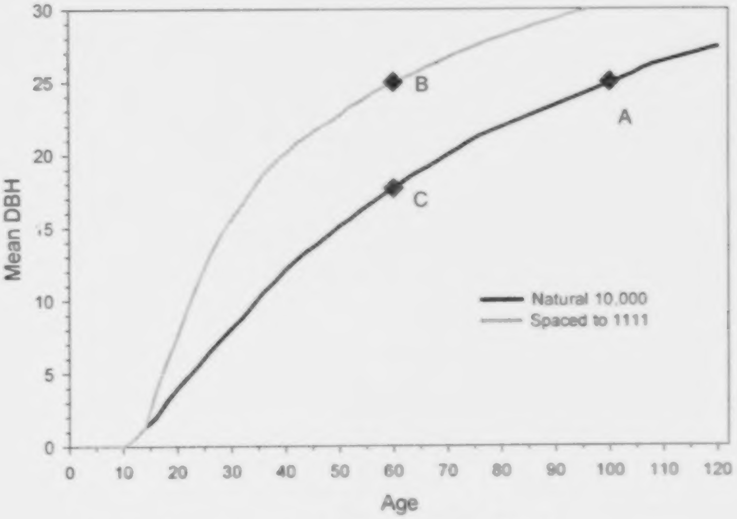

Figure 7. Harvest ages based on mean DBH.

An alternative approach would be to forgo the juvenile spacing and simply reset the minimum harvest age at 60. Although the mean DBH is only 18cm, the unthinned stand carries slightly more merchantable volume (4%) than the thinned stand would at the same age (Table 5). The harvest revenue predicted for the unthinned stand is about 3% lower, but the cost of the spacing has been avoided altogether.

Table 5. Comparison of points C and B from Figure 7.

| | C | B | C/B |
|---|---|---|---|
| Treatment | unspaced | spaced | ratio |
| DBH (cm) | 17.7 | 25 | 0.71 |
| Merch. Volume (m$^3$/ha) | 338 | 326 | 1.04 |
| Harvest Revenue ($/ha) | 34,090 | 35,053 | 0.97 |

The large difference in mean DBH between the thinned and unthinned stand conceals the fact that the largest trees in the unthinned stand are nearly as large as the largest trees in the thinned stand. Much of the difference in mean DBH is due to the artificial *chainsaw effect* (Ministry of Forests, 1999) caused by the removal of the small trees in the thinned stand.

## 4.2 WOOD QUALITY

### *4.2.1 Current Products and Markets*

The Pope and Talbot sawmills that process timber from TFL 8 produce kiln dried, random length dimensional lumber for North American market. Approximately 90% of the lumber is sold in the USA and 10% in Canada. Byproducts such as chips, sawdust, chipfines, planer shavings and hog fuel are sold to other manufacturing facilities in the region. Input capacity

Pope & Talbot currently manufactures a range of high quality, solid-wood products from trees cut on the TFL. These include long length (22' & 24') dimension lumber; MSR and appearance grade lumber; 1" appearance grade boards; cedar decking; timbers; and railroad ties. Fdi, Lw, and Pl provide high MSR recovery and also have proved valuable for structural and appearance lumber.

Input capacity is approximately 800,000 $m^3$/yr with Midway running two shifts and Grand Forks one shift. Both mills rely on high lumber recovery for profitability.

### *4.2.2 Product Vision to 2020*

Pope and Talbot's expectation of the solid wood markets to the year 2020 area summarized below.

| Product Component | Medium Term Perspective (5-10 years) | Long Term Perspective (20+ years) |
|---|---|---|
| MSR lumber | Continued market premium and expanded use in engineered wood products. | Continued market premium and expanded use in engineered wood products. |
| Appearance grade boards | Continued market premium. | unknown |
| Long lengths | Continued market premium | Probable replacement by engineered products |
| Wider dimensions (2x10, 2x12): | Will not remain competitive with engineered products | Complete replacement by engineered wood products |
| Fdi, Lw, and Pl | Continued value for properties such as high specific gravity | Continued value for properties such as high specific gravity |
| Log Quality | Higher value for low taper, low wane, and small knots | Higher value for low taper, low wane, and small knots |

### 4.2.3 Silviculture and Wood Quality

The basic wood quality attributes that can be affected by silviculture are the proportion of juvenile wood, specific gravity (relative density), knot size and frequency, and the relative proportions of earlywood and latewood. Log quality is affected by diameter, length, uniformity, taper, knots, sweep, shake and pathological indicators.

Wood quality must be defined with reference to some specified product (Zobel and van Buijtenen, 1989). In Pope and Talbot's long-term view of the future, there will be less emphasis on large dimension lumber and more emphasis on smaller dimension lumber and engineered wood products. Wood quality, in this context, is defined by the basic fibre properties as influenced by specific gravity, juvenile wood and knot size. Lumber recovery is important in any context.

Higher wood quality, under this definition, is generally associated with higher stand densities ((Zobel and van Buijtenen, 1989). Rapid crown recession tends to produce smaller knots, less taper and an earlier transition from juvenile to mature wood. If the specific gravity of a species is negatively affected by growth rate, then the higher density stands will produce the densest wood.

Stands managed to the current MOF target densities for planting and juvenile spacing will likely not produce the wood quality desired by Pope and Talbot. Studies of branch size in 20-year-old Pl stands in the Merritt and Kamloops areas (J.S. Thrower and Associates, 1999b) show that most branches already exceed 2.5cm in diameter when current density is less than 2000 stems/ha. Furthermore, the increased taper in more widely spaced stands will decrease lumber recovery. A study of taper in Pl stands (J.S. Thrower and Associates, 2000c) suggested that the taper in stands at target densities will have twice the taper, which could mean losses of 10% or more in lumber recovery.

Pruning treatments are a solution to the branch size problem and, in addition, promote the transition from juvenile wood to mature wood. At Pl densities of 1200ha to 1600/ha, however, the will be little clear wood recovered (J. S. Thrower and Associates, 2000c). Nevertheless, it may be worthwhile to consider pruning these stands simply to keep the branches from getting any larger.

There is little doubt that the highest growth rates per tree result from the ample growing space afforded in low density stands. Historically, log and tree sizes have been good indicators of product value. Studies of wood quality in second growth stands, however, suggest that larger size of trees and higher growth rates frequently will not compensate for "the detrimental effects of increased tree taper, larger branches and higher proportions of juvenile wood" (Josza and Middleton, 1994).

## 4.3 WILDLIFE HABITAT

The major wildlife habitat issue on TFL 8 is mule deer winter range (MDWR) and the Ministry of Environment, Lands and Parks (MOELP) has specified that the most critical habitat attribute is cover. Consequently, the main objective of silviculture in the MDWR areas has been to create all-aged, multi-layered stands for maintenance of cover. A wide array of silvicultural systems is employed on TFL 8, but single-tree selection is the system of choice in MDWR areas.

A wildlife management plan for the TFL is currently being developed for Pope and Talbot by Dr. Darryl Hebert and Interior Reforestation Ltd. Based on a review of recent research, Dr. Hebert has suggested that the quantity and quality of browse and forage should receive more emphasis in MDWR. If a review of stand conditions in MDWR indicates that these results apply to TFL 8, then there will probably be a shift in emphasis in silviculture prescriptions. If, for example, it is necessary promote additional growth of shade intolerant browse species, then there needs to be a reduction in crown cover in some stands within MDWR to allow those species to flourish. If this viewpoint is accepted by MOELP there will be fewer prescriptions for single-tree selection in the future, with more emphasis on patch cutting, shelterwood and seed-tree systems.

## 4.4 INSECT AND DISEASE PESTS

### *4.4.1 Insect and Disease Issues*

Forest insects and disease play a significant role in stand development on TFL 8. Furthermore, forest management on the TFL has long recognized the importance of ameliorating and accommodating the effects of forest pests. The main pests issues on the TFL are summarized below.

#### *4.4.1.1 Bark beetles*

Periodic catastrophic infestations of bark beetles – particularly mountain pine beetle – figure prominently in the history of TFL 8. The most recent outbreak of mountain pine beetle started in the 1980s. A temporary uplift in the AAC was granted to Pope and Talbot to combat the infestation on the TFL. The result of the accelerated harvesting of Pl is that there now relatively few mature stands with Pl as the leading species within the TFL. The major concern, therefore, is for the current immature stands that will become more susceptible over the next three decades.

#### *4.4.1.2 Spruce Budworm*

Spruce budworm is a concern only in the IDF stands less than 1100m in elevation.

#### *4.4.1.3 Root Diseases*

The root diseases *Armillaria* and *Phellinus* are natural floristic elements of many of the ecosystems on TFL 8. There are few identifiable areas of heavy concentrations of root disease, but there are various concentrations of root disease throughout the IDF, ICH and MS subzones. Root disease is acknowledged in prescriptions for basic silviculture prescriptions by the frequent use of stumping.

### *4.4.2 Forest Pests and Silviculture*

#### *4.4.2.1 Bark Beetles*

The risk and associated impact of mountain pine beetle is less in mixed-species stands than it is in pure pine stands. Encouraging the establishment and development of mixtures is one way to reduce beetle impacts in the long term.

For existing pine stands, research has demonstrated that the susceptibility to mountain pine beetle can be lessened by reducing stand density (Cochrane *et al.*, 1994; Mitchell *et al.*, 1983). It is not clear that density management alone will preserve pure pine stands in a major outbreak. Commercial thinning of older stands is currently viewed as short-term tactic that may help delay rather than prevent beetle attack.

#### *4.4.2.2 Spruce Budworm*

The stand structures that will be most affected by spruce budworm are those that have susceptible species in both the upper and lower strata. For example, in stands where Douglas-fir dominates both strata, prolonged infestations will decimate the lower stratum. The potential impact of spruce budworm can be lessened by silvicultural practices in two ways. The first is promoting the establishment of mixed-species stands. The second is to prescribe fewer applications of the silvicultural systems that lead to relatively pure and vertically stratified stands of Douglas-fir – i.e., single-tree selection and the uniform shelterwoods with substantial overstory.

#### *4.4.2.3 Root Diseases*

The potential impacts of *Armillaria* and *Phellinus* can also be reduced by promoting the establishment and development of mixed-species stands. Some silvicultural treatments, such brushing, juvenile spacing and commercial thinning, can unintentionally stimulate the activity of root diseases. Current silviculture guidelines discourage treatments in stands with obvious symptoms of root disease, but many low-level infections are difficult to diagnose. A prudent approach is to minimize post-establishment interventions in ecosystems in which *Phellinus* and *Armillaria* are prominent.

## 5. INTERIM INCREMENTAL SILVICULTURE STRATEGY

The preceding evaluation of the existing timber supply analysis and available information on response to silvicultural treatments leads to the following recommendation for an interim strategy for incremental silviculture investments. This should be regarded as an interim strategy until the next timber supply analysis is completed and there is an opportunity to incorporate the most recent harvest flow schedules into the strategy.

1. **Use genetically improved stock as much as possible.**
   Planting stock grown from Class A seed is the most cost-effective way to improve the yield of regenerated stands.

2. **Emphasize full site occupancy in silviculture regimes.**
   Pope and Talbot have already recognized that maintaining full site occupancy will enhance merchantable volume, and adjusted upward their density management targets for planting and juvenile spacing. This approach is consistent with their view of future in which there will be premiums for high quality but with more emphasis on engineered wood products than wide dimension lumber. This density management strategy should be expanded by pursuing the following recommendations:
   a) Encourage natural regeneration to complement planted stock and achieve higher initial densities.
   b) Aim for establishment densities (planted + natural) greater than 2500 stems/ha.
   c) Aim for higher post-spacing densities (2500-4000 stems/ha) to promote higher wood quality, lower costs of spacing and reduce losses to forest pests. Minimum inter-tree distance requirements should be set below 50cm and preferably at 25cm.
   d) Minimize unnecessary juvenile spacing and brushing activities to retain higher densities and reduce losses to forest pests.
   e) Evaluate the effectiveness of fill-in planting to ensure full site occupancy in young stands that currently meet minimal free growing requirements.

3. **Encourage the establishment and development of mixed-species stands.**
   The impact of forest pests tends to be less severe in mixed-species stands. For the types of mixtures that occur naturally on TFL 8, the mixed-species stands will usually have higher yields than single-species stands. Mixtures should be encouraged by pursuing the following recommendations:
   a) Ensure the development of mixtures by planting minor components of complementary species. For example, the planting of larch should be expanded to introduce more larch into regenerated stands that might otherwise be nearly pure Pl. Larch offers fast growth rates, resistance to disease and high-quality fibre (Sauter *et al.*, 1999).

b) Ensure that mixed-species stands remain mixed after juvenile spacing. Spacing guidelines sometimes have unintended pernicious effects, such as removing small, shade tolerant spruce. To encourage the development of stratified mixtures, it may be necessary to explicitly allow for the retention of such trees by adjusting the countable height limit to 50% or higher.

4. **Evaluate the potential for fertilization.**
The next timber supply analysis will help clarify the potential value of a fertilization program on TFL 8. In particular, if a short-term drop in harvest flow appears in the 5th or 6th decade, then fertilization may be a good investment.

5. **Look for opportunities to prune legacy stands.**
TFL 8 has a substantial legacy of Pl stands that have been either planted or spaced to densities that are too low for the future product requirement of Pope and Talbot. These stands already have large branches which are still growing. Although pruning these stands will not lead to optimal financial returns, the resulting stand will likely be more valuable than if these already large branches are allowed to grow larger. Funding intended for job creation in forestry might be better spent on pruning of legacy stands rather than on spacing activities that will produce stands that are inconsistent with Pope and Talbot's product goals.

It can be expected that both the next timber supply analysis and the Type 2 Incremental Silviculture analysis will revise some of the assumptions and estimates used to generate these projections. New estimates may reflect improved information about the landbase or the effects of silvicultural treatments. In some cases, an investment in improved information may have a greater effect on either the magnitude or the credibility of the predicted harvest flow than the silvicultural treatment itself.

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# 7. APPENDIX I INCREMENTAL SILVICULTURE ACTIVITIES

## 7.1 PRE 1987 OVERVIEW

Table 6. Overview of stands logged prior to 1987.

| Status | Notes | Area (ha) |
|---|---|---|
| FG | Free-Growing. Generally no further treatment required except the pruning areas fall within this category and there could be some enhanced spacing done (probably not more than 200-300 ha). | 9,837 |
| SR | Not yet Free-Growing due to Height or Brush. Probably 25% of this will require some brush treatment, either chemical or manual (the latter done in conjunction with spacing). These areas have been proposed or scheduled either for treatment or free-growing surveys over the next 5 years. | 2,369 |
| NSR | see separate table | 490 |
| Unknown | Mostly remnants of blocks spaced - mixed SR/FG, mature, NP, possibly some NSR, etc. (00/01 walkthroughs to be done) | 135 |
| NP | Generally small NP strata within blocks (16 ha total of swamp, 13 ha Open Rock, 32 ha NCBr) | 61 |
| Mature | Small mature patches within blocks. | 31 |
| NP-Road | Only on some blocks have roads been netted out. This is really much higher (i.e could use the standard 7%) and is a mapping project that will be done in the next year or two. | 57 |
| Total | | 12,980 |

## 7.2 Summary of Past Incremental Silviculture Activities

Table 7. Incremental silviculture treatment area by year.

| Year | Juvenile Spacing | Manual Brushing | Chemical Brushing | Pruning |
|---|---|---|---|---|
| 1982 | 7.8 | | | |
| 1985 | 71.5 | | | |
| 1986 | 21.7 | | | |
| 1987 | 80.6 | | | |
| 1988 | 81.1 | | | |
| 1989 | 391.1 | 80.9 | | |
| 1990 | 193.8 | | | |
| 1991 | 221.8 | | | |
| 1992 | 566.6 | | 5.5 | |
| 1993 | 657.1 | | 29.2 | |
| 1994 | 544.5 | | | |
| 1995 | 619.4 | | | 44.0 |
| 1996 | 747.8 | | | 95.7 |
| 1997 | 719.5 | | | |
| 1998 | 624.9 | | | |
| 1999 | 207.6 | 166.9 | | |
| **Total** | **5,757** | **248** | **34.7** | **139.7** |

## 7.3 Current Incremental Silviculture Program Plan

Table 8. Current 5-year incremental silviculture program plan (area).

| Year | Spacing | Manual Brush | Prune | Plant (NSR) | BSP | SMP/TP | Survey (ST/FG) | Survey (Walkthru) |
|---|---|---|---|---|---|---|---|---|
| 2000 | 13 | 4 | | 196 | 58 | | | 800 |
| 2001 | | 187 | | 37 | *50* | *300* | 1162 | 482 |
| 2002 | *150* | 93 | | *50* | | *200* | 520 | |
| 2003 | *150* | *30* | *44* | | | *300* | 365 | |
| 2004 | *150* | *30* | *6* | | | | *150* | |
| 2005 | *150* | *49* | | | | | *150* | |
| 2006 | | | | | | | *150* | |
| 2007 | | | | | | | *150* | |
| 2008 | | | | | | | *150* | |
| 2009 | | | | | | | *150* | |
| 2010 | | | | | | | *150* | |
| Total | 613 | 393 | 50 | 283 | 108 | 800 | 3097 | 1282 |

## 7.4 PRE 1987 NSR PLANS

Table 9. Plans for treatment of pre-1987 NSR areas.

| Status | Area (ha) |
|---|---|
| Plant 2000 | 195 |
| Plant 2001 | 37 |
| Plant 2002 | 11 |
| Probable fill-plant (Requires BSP's) | 115 |
| Probably Stocked (Requires re-survey) | 102 |
| Probable NCBr | 28 |
| Total March 2000 NSR | 490 |

## 7.5 POTENTIAL INCREMENTAL SILVICULTURE TREATMENTS

Table 10. Summary of potential incremental silviculture treatment.

| Activity | Area (ha) |
|---|---|
| Backlog | 489 |
| Spacing | 667 |
| Manual brushing | 257 |
| Chemical brushing | 82 |
| Pruning | 140 |
| Fertilization (spaced) | 7011 |
| **Total** | 8646 |

# 8. APPENDIX II WORKSHOP SUMMARY

## 8.1 WORKSHOP OVERVIEW

A silviculture strategy workshop was facilitated by J.S. Thrower and Associates at the Grand Forks office of Pope and Talbot on January 25, 2000. The attendees are listed in Table 11 below. The objectives of the workshop were:

- to seek input from knowledgeable individuals with local experience in the application and evaluation of silvicultural treatments.
- to summarize management issues that might be addressed through silviculture.
- to discuss the current information about the responses to silvicultural treatments and it's relevance to TFL 8.

Table 11. List of workshop attendees.

| Name | Affiliation |
|---|---|
| Steve Baumber, R.P.F | J.S. Thrower |
| Geoff Bekker, R.P.F. | Pope & Talbot |
| Ian Cameron, R.P.F. | J.S. Thrower |
| George Delisle | Pope & Talbot |
| Lyle LeClair, R.P.F. | Pope & Talbot |
| Gordon LeSergent, R.P.F | Ministry of Forests, Boundary District |
| Ivan Listar, R.P.F. | Ministry of Forests, Nelson Region |
| Mark Messmer, R.P.F. | J.S. Thrower |
| Randy Waterous | Pope & Talbot |

The framework for the workshop was a series of presentations by J.S. Thrower staff on the principles of timber supply analysis, stand-level and forest-level effects of silvicultural treatments and management issues that affect timber supply analysis.

## 8.2 ISSUES IDENTIFIED

Discussions at the workshop brought to light some new issues and provided additional insight into other issues previously identified in the growth and yield strategy. The following section is an abridged summary of the issues identified and discussed at the workshop.

| Issue | Background |
|---|---|
| **Establishment to Free-Growing** | • The time to reach green-up, as modelled in Timber Supply Analysis, may be too long. Local experience and ISIS summaries suggest that the time period may be shorter.<br>• Early fertilization to hasten free growing has had mixed results locally. Some local trials do exist and should be examined. Fertilization may not help on brushy sites because nutrient deficiency is not the issue.<br>• Local experience suggests that the issue of regeneration delay is best addressed by minimizing time lags between the harvesting, site preparation and planting phases.<br>• Currently the proportion of planting stock derived from improved seed is 100% for Sx, 10% for Lw and 30% for Pl. |
| **Forest Health** | • An increase in mountain pine beetle activity may have little impact in the short term. Accelerated harvesting in the 1980s and early 1990s has left few susceptible stands. MPB may be more of an issue in the medium and long terms as regenerated stands approach the size and age of susceptibility.<br>• For spruce budworm, the main areas of concern are IDF stands lower than 1100m elevation.<br>• Stumping is a common practice on TFL 8, but is considered a basic obligation rather than incremental silviculture.<br>• Stem rusts are not an extensive problem, but a small number of stands have suffered severe losses.<br>• Trap tree programs for Douglas-fir beetle and spruce beetle have been effective. The practice may be less effective in the future if biodiversity or stand structure requirements prohibit the removal of large trees. |
| **Mule Deer Winter Range (MDWR)** | • Under current definitions, over 40% of TFL 8 has some designation for MDWR. By subzone, the MDWR covers 40% of MS, 90% of the IDF and 10% of the ICH.<br>• The current focus of management in MDWR is partial cutting to meet cover requirements. A wildlife planning initiative is currently underway, and will address this issue in more detail. |

| Issue | Background |
|---|---|
| **Product Objectives** | • Pope & Talbot currently obtains premium prices for long length (24') dimension lumber, but they don't expect those premiums to be maintained in the medium and long term. High quality MSR lumber in 2X4 and 2X6 dimensions are viewed as the product likely to be in demand in the future. |
| **Grazing** | • Grazing takes place in all areas of the TFL.<br>• The potential impacts of compaction and tree damage have not been assessed, but are a concern.<br>• Potential silvicultural treatments to enhance grazing include wide spacing of trees and planting or seeding of forage species. |
| **Biodiversity** | • A re-evaluation of the definition of Natural Disturbance Type 4 (NDT4) is currently underway by the MOF and MOELP. Draft maps are available. A broader definition might impose partial cutting requirements over more area. The biggest concern is reallocating areas from "managed forest" to "open forest". Local experience suggests that large areas of the IDF and MS may actually have disturbance histories that don't fit the NDT4 definition.<br>• Old Growth Management Areas (OGMAs) will place constraints on management, particularly in watersheds. There is a perception that old growth is in short supply even though Age Class 8 covers the most area on the TFL. Partial cutting may be able to accelerate the attainment of some old-growth characteristics in mature stands. There is general recognition that some attributes can only develop over long periods of time.<br>• If seral stage distribution receives more attention in the future, there may be some additional stand structure requirements for TFL 8. Some of those may be met through silvicultural treatments.<br>• For calculation of Equivalent Clearcut Area (ECA), stands approach 90% of recovery at a height of 9m. Fertilization may help attain 9m sooner in some areas. Use of improved stock may also hasten recovery. |
| **Visual Quality Objectives** | • The corridors for highways 3 and 33, and the Jewel Lake area have high scenic values.<br>• The Kettle Valley Railway right-of-way does not currently have VQOs, but Pope & Talbot is aware of the high recreational use and is being proactive in their management. |

# Appendix 4 – Enhancing Environmental Values

# Appendix 4 a) - Species & Stocks of Concern in the Kootenay Region (Including Boundary Forest District)

| SpeciesID | Species Code | Species | Species Location(s) | Rational |
|---|---|---|---|---|
| 1 | BT | Bull Trout | Throughout the Region | Blue listed species |
| 6 | BB | Burbot | Kootenay Lake, Kootenay River, Columbia River between Keenleyside Dam and US-Canada border, Columbia Lake, Koocanusa, Moyie Lake, Christina Lake | Columbia River and Kootenay Lake burbot populations have declined severely and are currently being reviewed for red listing. A petition for ESA listing of Kootenay burbot (same population as Kootenay Lake) is expected in Idaho this fall. All fisheries for these populations collapsed and are now closed. Intensive studies and rehabilitation efforts are presently underway. |
| 13 | CMC | Chiselmouth | Kettle River below Cascade | Blue listed species |
| 8 | KO | Kokanee | Grave Lake, Upper and Lower Arrow Reservoir, West Arm of Kootenay Lake (Redfish, Kokanee, Harrop, Lasca, Duhamel, Laird, and Sitkum creeks), Christina Lake and Tributaries | Grave Lake - Unique Shoal spawning kokanee. Arrow kokanee stocks have collapsed due to a decrease in lake productivity caused from dam development. A five year experimental lake fertilization project commenced in spring 1999 to increase lake productivity and kokanee. West Arm kokanee are a unique stock which only inhabit the West Arm of Kootenay Lake and are different (i.e., size & age at spawning) from North and South Arm kokanee. Production of this stock is primarily from two spawning channels constructed in Redfish and Kokanee creeks, with other important but limited spawning in a number of other tributaries to the West Arm which are listed in the species location(s). These fish support an extremely unique and popular fishery in the West Arm. |
| 11 | LMB | Large Mouth Bass | Duck Lake near Creston, Christina Lake | Unique stock to the West Kootenay. Quality fishery (international destination fishery). |

## Appendix 4 a) - Species & Stocks of Concern in the Kootenay Region (Including Boundary Forest District)

| | | | |
|---|---|---|---|
| 2 CBA | Mottled Sculpin | Flathead River, Kootenay River above South Slocan Dam, Kootenay River below Slocan River, Columbia River between Keenleyside Dam and US-Canada border, Kettle River below Cascade | Blue listed species |
| 9 RB | Rainbow Trout | Kootenay Lake and Lardeau River, Goatskin Creek | Unique world famous large rainbow from Kootenay Lake. Stock supports a fishery in KL worth over$2 million per year. Goatskin population may be glacial relict due to no headwater stocking and downstream barriers. |
| 3 CCN | Shorthead Sculpin | Slocan River, Columbia River between Keenleyside Dam and US-Canada border, Norns Creek, Blueberry Creek, Kettle River below Cascade. | Blue listed species |
| 14 SDC | Speckled Dace | Kettle River, W. Kettle River and Granby River | Red listed species. BCCDC recommends protection of habitat for this unique population. |
| 5 UDC | Umatilla Dace | Kootenay River below Brilliant Dam, Slocan Pool, Slocan River at Kootenay River, Kootenay River above South Slocan Dam, Pend d'Oreille River, Columbia River between Keenleyside Dam and US-Canada border, China Creek, Beaver Creek, Blueberry Creek, Kettle River below Cascade. | Red listed species |
| 12 WCT | Westslope Cutthroat Trout | Akolkolex River & Kirkup Creek | Unique because they are the only river resident stock in the West Kootenay supporting considerable effort as a catch-and-release fishery. High commercial and recreational value. Also, they are an endemic population that hasn't been hybridized with RB. |

## Appendix 4 a) - Species & Stocks of Concern in the Kootenay Region (Including Boundary Forest District)

| | | | |
|---|---|---|---|
| 10 WCT | Westslope Cutthroat Trout | East Kootenays | High commercial and recreational value. Also, their traditional range is rapidly disappearing in the USA |
| 4 WSG | White Sturgeon | Kootenay Lake, Duncan Reservoir, Slocan Lake, Arrow Reservoir, Revelstoke Reservoir, Kootenay, Columbia, Pend d'Oreille Rivers, unconfirmed reports for Christina Lake | Red listed species |
| 7 RB | Yellow-Fin Rainbow Trout | Arrow Reservoir | Unique large rainbow trout native only to Arrow Reservoir. Impacts of dam development has resulted in this stock being close to extinction. Attempts have and are being made to collect enough fish to start a hatchery brood program. |

## Appendix 4b – Fish and Water Ranking Description

| **Fish Rank Code** | **Description** |
|---|---|
| VH1 | Contains endangered, threatened species or stocks (Red Listed Species). |
| VH2 | Contains two or more species/stocks of concern AND provides or contributes to a significant commercial and/or recreational fishery |
| H1 | Contains one species/stocks of concern AND provides or contributes to a significant commercial and/or recreational fishery |
| H2 | Contains one or more species/stocks of concern, BUT does not provide or contribute to a significant commercial and/or recreational fishery |
| M | Contains no species/stocks of concern |

| **Water Rank Code** | **Description** |
|---|---|
| VH | Forest Practices Code community watersheds |
| H | Significant domestic water-supply watersheds (>15 licenses) |
| M | Other domestic water supply watersheds |
| L | No community or domestic watershed |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Summary of Investment Status and Estimated Budget for the Caribou Watershed- Slocan Forest Products (page 1 of 2)** | | | | | | | |
| Date: August 29/00 | | | | | | | |
| **Watershed Investment Phase** | **Watershed Components** | **Status( complete, ongoing, planned)** | **Estimated Outputs to complete ( Ha. or Km)** | **Estimated Budget to complete** | **Year 1 (2001-2002) $** | **Year 2 (2002-2003) $** | **Year 3 (2003-2004) $** |
| Watershed Planning & Coordination | | ongoing/planned | | **$15,000** | **$5,000** | **$5,000** | **$5,000** |
| **Rodd/ Mineral/ Blue Grouse Sub-basins** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed- 1994 | N/A | | | | |
| | Overview FHAP | planned | | $5,000 | $5,000 | 0 | 0 |
| | Level 1- FHAP | pending Overview results | ? | | | | |
| | | | | | | | |
| Restoration Works | Instream | pending assessment | | | | ? | |
| | Roads | ineligible | | | | | |
| | | | | | | | |
| | | **Sub-basin Total** | | **$5,000** | **$5,000** | ? | ? |
| **Walton/ Unnamed Creek #1 Sub-basins** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed- 1994 | | | | | |
| | Roads- Level 2 | completed- 1995 | | | | | |
| | Overview FHAP | planned | | $2,000 | $2,000 | | |
| | CAP | planned | ? | $5,000 | | $5,000 | |
| | | | | | | | |
| Restoration Works | Roads | completed 1997-99 | | | | | |
| | Instream Works | pending CAP results | ? | $10,000 | | $10,000 | |
| | | | | | | | |
| Monitoring & Evaluations | Instream Works | planned | ? | $2,000 | ? | | $2,000 |
| | | **Sub-basin Total** | | **$19,000** | **$2,000** | **$15,000** | **$2,000** |
| **Unnamed Creek #2/ Headwaters/ Upper Caribou Creek Residual Sub-basins** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed- 1994 | | | | | |
| | Roads- Level 2 | completed- 1995 | | | | | |
| | | | | | | | |
| Restoration Works | Roads | completed 1997-99 | | | | | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | completed 1999 | | | | | |
| | | **Sub-basin Total** | | **$0** | **$0** | **$0** | **$0** |
| | | **Grand Total (pg 1)** | | **$39,000** | **$12,000** | **$20,000** | **$7,000** |

| Summary of Investment Status and Estimated Budget for the Caribou Watershed- Slocan Forest Products (page 2 of 2) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date:August 30/00 | | | | | | | |
| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ |
| Watershed Planning & Coordination | | ongoing/planned | | **$6,000** | **$2,000** | **$2,000** | **$2,000** |
| **Lower Caribou Creek Sub-basin (Bell Pole's Chart)** | | | | | | | |
| | Level 1- Road Overview | completed-1994 | N/A | | | | |
| | Level 2- Roads | planned | 20 km | $10,000 | $10,000 | | |
| | | | | | | | |
| Restoration Works | Roads | pending assessment | ? | ? | | ? | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | pending assessment | ? | ? | | | ? |
| | | **Sub-basin Total** | | **$10,000** | **$10,000** | **$0** | **$0** |
| **Londonderry Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed-1994 | | | | | |
| | Roads- Level 2 | completed- 1995 | | | | | |
| | Overview FHAP | planned | N/A | $2,000 | $2,000 | | |
| | Level 1- FHAP | pending assessment | ? | | | ? | |
| | | | | | | | |
| Restoration Works | Roads | ongoing- 2000 | 24 km | | | | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 24 km | $2,000 | $2,000 | | |
| | | **Sub-basin Total** | | **$4,000** | **$4,000** | **$0** | **$0** |
| **Goat Canyon Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed-1994 | N/A | | | | |
| | Roads- Level 2 | planned | 6 km | $3,000 | $3,000 | | |
| | | | | | | | |
| Restoration Works | Roads | pending assessment | ? | ? | | ? | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | pending assessment | ? | ? | | | ? |
| | | **Sub-basin Total** | | **$3,000** | **$3,000** | **$0** | **$0** |
| | | | | | | | |
| | | **Grand Total (pg 2)** | | **$23,000** | **$19,000** | **$2,000** | **$2,000** |

**WATERSHED TOTAL** **$62,000** **$31,000** **$22,000** **$9,000**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Summary of Investment Status and Estimated Budget for Watershed A,** | | | | | | | |
| Date: | | | | | | | |
| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ |
| **Sub-basin a** | GOLD RIVER - GIS clrh 04000015 | | | | | | |
| Watershed Planning & Coordination | | | | | | | |
| Assessments/ Prescriptions | Roads | ongoing | 10 km | 8K | 8K | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | planned | 10 km | 8K | | 8K | |
| | Instream | planned/complete | 10 km | 8K | | 8K | |
| | | (fish inventory done) | | | | | |
| Restoration Works | Roads | ongoing | 10 km | 100K | 30K | 30K | 40K |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | planned | 2 km | 20 k | | 20k | |
| | Instream | planned/complete | 1 km | 10 k | | 10k | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 10km | 3 k | 1 k | 1K | 1K |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | planned | 2 km | 2 k | | 1K | 1 K |
| | Instream | planned | 1 km | 1 k | | .5 K | .5 K |
| | | Sub-basin Total | | 160 k | | | |
| **Sub-basin b** | BACHELOR CREEK GIS TAG CLRH 04000015 | | | | | | |
| Assessments/ Prescriptions | Roads | complete+ongoing | 20 km | 8K | 8K | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | planned | 15 km | 15 K | | 15K | |
| | Instream | planned/complete | 15 km | 15 K | | 15K | |
| | | (fish inventory done) | | | | | |
| Restoration Works | Roads | ongoing | 20 km | 180K | 80K | 50K | 50K |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | planned | 2 Km | 20 K | | 20 K | |
| | Instream | planned | 1 KM | 10K | | 10 K | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 20 km | 5K | 1.7K | 1.7K | 1.7K |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | planned | 2 Km | 1 K | | | 1 K |
| | Instream | planned | 1 KM | 1 K | | | 1 K |
| | | Sub-basin Total | | 255 k | | | |
| | | Grand Total | | 415 k | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Summary of Investment Status and Estimated Budget for Watershed A,** | | | | | | | |
| Date: | | | | | | | |
| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ |
| **Sub-basin a** | ESPLANDE - GIS TAG GD_18 | | | | | | |
| Watershed Planning & Coordination | | | | | | | |
| Assessments/ Prescriptions | Roads | planned | 15 km | 12 K | 12K | 0 | 0 |
| | Hillsides | planned | 1 ha | 3 K | 3 K | | |
| | Gullies | | | | | | |
| | Riparian | planned | 5 ha | 5K | | 5K | |
| | Instream | planned/complete | 5 ha | 5K | | 5K | |
| | | (fish inventory done) | | | | | |
| Restoration Works | Roads | planned | 15 km | 150k | 75k | 75k | |
| | Hillsides | planned | 1 ha | 20k | | 20k | |
| | Gullies | | | | | | |
| | Riparian | planned | .5 ha | 15k | | | 15k |
| | Instream | planned | .5 ha | 15k | | | 15k |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 15 km | 2k | | 1k | 1k |
| | Hillsides | planned | 1 ha | .5k | | | .5k |
| | Gullies | | | | | | |
| | Riparian | planned | .5 ha | .5k | | | .5k |
| | Instream | planned | .5 ha | .5k | | | .5k |
| | | Sub-basin Total | | | | | 228.5 K |
| **Sub-basin b** | | | | | | | |
| Assessments/ Prescriptions | Roads | | | | | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | | | | | | |
| | Instream | | | | | | |
| | | | | | | | |
| Restoration Works | Roads | | | | | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | | | | | | |
| | Instream | | | | | | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | | | | | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | | | | | | |
| | Instream | | | | | | |
| | | Sub-basin Total | | | | | |
| | | Grand Total | | | | | |

## Summary of Investment Status and Estimated Budget for Gold / Joseph Watershed

Date: August 29, 2000

| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete (Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ | Year 4 (2004-2005) $ | Year 5 (2005-2006) $ |
|---|---|---|---|---|---|---|---|---|---|
| **Sub-basin : Gold** | | | | | | | | | |
| Watershed Planning & Coordination | | | | | | | | | |
| Assessments/ Prescriptions | Roads | Planned | 20 km | 10,000 | 10,000 | | | | |
| | Hillsides | | | | | | | | |
| | Gullies | | | | | | | | |
| | Riparian | Planned | 1.5 km | 5,000 | 5,000 | | | | |
| | Instream | Planned | 3.3 km | 14,000 | 14,000 | | | | |
| Restoration Works | Roads | | | | | | | | |
| | Hillsides | | | | | | | | |
| | Gullies | | | | | | | | |
| | Riparian | Planned | 1.5 km | 29,000 | | 29,000 | | | |
| | Instream | Planned | 3.3 km | 18,500 | | 18,500 | | | |
| Monitoring & Evaluations | Roads | | | | | | | | |
| | Hillsides | | | | | | | | |
| | Gullies | | | | | | | | |
| | Riparian | Planned | 1.5 km | 1,000 | | | 1,000 | | |
| | Instream | Planned | 3.3 km | 2,500 | | | 2,500 | | |
| | | **Sub-basin Total** | | 80,000 | 29,000 | 47,500 | 3,500 | 0 | 0 |
| **Sub-basin: Joseph** | | | | | | | | | |
| Assessments/ Prescriptions | Roads | Planned | 5.0 km | 2,500 | | 2,500 | | | |
| | Hillsides | | | | | | | | |
| | Gullies | | | | | | | | |
| | Riparian | Planned | 3.7 km | 10,000 | | | 10,000 | | |
| | Instream | Planned | 4.0 km | 10,500 | | | 10,500 | | |
| Restoration Works | Roads | | | | | | | | |
| | Hillsides | | | | | | | | |
| | Gullies | | | | | | | | |
| | Riparian | Planned | 3.7 km | 18,000 | | | | 18,000 | |
| | Instream | Planned | 4.0 km | 36,500 | | | | 36,500 | |
| Monitoring & Evaluations | Roads | | | | | | | | |
| | Hillsides | | | | | | | | |
| | Gullies | | | | | | | | |
| | Riparian | Planned | 3.7 km | 2,000 | | | | | 2,000 |
| | Instream | Planned | 4.0 km | 2,000 | | | | | 2,000 |
| | | **Sub-basin Total** | | 81,500 | 0 | 2,500 | 20,500 | 54,500 | 4,000 |
| | | ***Grand Total*** | | 161,500 | 29,000 | 50,000 | 24,000 | 54,500 | 4,000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Summary of Investment Status and Estimated Budget for Watershed A,** | | | | | | | |
| Date: | | | | | | | |
| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ |
| **Sub-basin a** | Bayonne Creek | | | | | | |
| Watershed Planning & Coordination | | | | | | | |
| Assessments/ Prescriptions | Roads | | | | | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | Planned | 15 km | $5,000.00 | $5,000.00 | | |
| | Instream | Planned | 15 km | $5,000.00 | $5,000.00 | | |
| | | | | | | | |
| Restoration Works | Roads | Planned | 31 km | $30,000.00 | $30,000.00 | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | | | | | | |
| | Instream | | | | | | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | Ongoing | 60 km | $3,000.00 | | $3,000.00 | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | | | | | | |
| | Instream | | | | | | |
| | | Sub-basin Total | 121 km | $43,000.00 | $40,000.00 | $3,000.00 | |
| **Sub-basin b** | Boundary/Upper Priest | | | | | | |
| Assessments/ Prescriptions | Roads | | | | | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | | | | | | |
| | Instream | | | | | | |
| | | | | | | | |
| Restoration Works | Roads | | | | | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | Ongoing | 1.5 km | $15,000.00 | $15,000.00 | | |
| | Instream | Ongoing | 0.5 km | $5,000.00 | $5,000.00 | | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | Planned | 50 km | $5,000.00 | $5,000.00 | | |
| | Hillsides | | | | | | |
| | Gullies | | | | | | |
| | Riparian | Ongoing | 1.5 km | $1,000.00 | | $1,000.00 | |
| | Instream | Ongoing | 0.5 km | $1,000.00 | | $1,000.00 | |
| | | Sub-basin Total | 54 km | $27,000.00 | $25,000.00 | $2,000.00 | |
| | | Grand Total | 175 km | $70,000.00 | $65,000.00 | $5,000.00 | |

**Summary of Investment Status and Estimated Budget for Watershed AR-28 (Deer, Ladybird, Cayuse)**

**Date:**

| Watershed Investment Phase | Watershed Components | Status (complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ | Comments |
|---|---|---|---|---|---|---|---|---|
| **Syringa Creek Sub-Basin** | | | | | | | | |
| Watershed Planning & Coordination | | | | | | | | |
| Assessments/ Prescriptions | Roads | Ongoing | | | | | | Will be completed 2000-2001 |
| | Hillsides | Complete | | | | | | Will be completed 2000-2001 |
| | Gullies | NA | | | | | | |
| | Riparian | NA | | | | | | |
| | Instream | NA | | | | | | |
| | | | | | | | | |
| Restoration Works | Roads | Ongoing | | | | | | Will be completed 2000-2001 |
| | Hillsides | Complete | | | | | | Will be completed 2000-2001 |
| | Gullies | NA | | | | | | |
| | Riparian | NA | | | | | | |
| | Instream | NA | | | | | | |
| | | | | | | | | |
| Monitoring & Evaluations | Roads | Planned | 30 | $10,000.00 | | | $10,000.00 | |
| | Hillsides | Planned | 10 | $3,000.00 | | | $3,000.00 | |
| | Gullies | NA | | | | | | |
| | Riparian | NA | | | | | | |
| | Instream | NA | | | | | | |
| | | | | | | | | |
| **Sub-basin Total** | | | | $13,000.00 | $0.00 | $0.00 | $13,000.00 | |

| Watershed Investment Phase | Watershed Components | Status (complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ | Comments |
|---|---|---|---|---|---|---|---|---|
| **Deer Creek Sub-Basin** | | | | | | | | |
| Watershed Planning & Coordination | | | | | | | | |
| Assessments/ Prescriptions | Roads | Ongoing | | | | | | Will be completed 2000-2001 |
| | Hillsides | Ongoing | | | | | | Will be completed 2000-2001 |
| | Gullies | NA | | | | | | |
| | Riparian | Complete | | | | | | |
| | Instream | Ongoing | 4 | $30,000.00 | $20,000.00 | $10,000.00 | | L1 FHAP, Prescriptions |
| | | | | | | | | |
| Restoration Works | Roads | Ongoing | | | | | | Will be completed 2000-2001 |
| | Hillsides | Ongoing | | | | | | Will be completed 2000-2001 |
| | Gullies | NA | | | | | | |
| | Riparian | NA | | | | | | |
| | Instream | Planned | 4 | $25,000.00 | | $25,000.00 | | Contingent on findings of Assessments |
| | | | | | | | | |
| Monitoring & Evaluations | Roads | Planned | 4 | $2,000.00 | | | $2,000.00 | |
| | Hillsides | Planned | 1 | $3,000.00 | | | $3,000.00 | |
| | Gullies | NA | | | | | | |
| | Riparian | NA | | | | | | |
| | Instream | Planned | 4 | $5,000.00 | | | $5,000.00 | |
| | | | | | | | | |
| **Sub-basin Total** | | | | **$65,000.00** | **$20,000.00** | **$35,000.00** | **$10,000.00** | |

| Watershed Investment Phase | Watershed Components | Status (complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ | Comments |
|---|---|---|---|---|---|---|---|---|
| **Cayuse Creek Sub-Basin** | | | | | | | | |
| Watershed Planning & Coordination | | Ongoing | 5000 | $15,000.00 | $15,000.00 | | | Restoration Plan preparation |
| Assessments/ Prescriptions | Road Maintenance & Deactivation Plan | Completed | 50 km | N/A | | | | FRBC and P&T funded. |
| | IWAP | Completed '97 | N/A | N/A | | | | FRBC funded |
| | Instream-RECAP | Completed '98 | N/A | N/A | | | | P&T funded. |
| | Instream - Level II C | Planned | 5000 ha | $25,000.00 | $25,000.00 | | | IWAP and RECAP recommendation |
| | FHAP Assessments | Planned | 5000 ha | $25,000.00 | $25,000.00 | | | Overview and Level II assessments |
| | Culvert Assessment | Planned | Unknown | $5,000.00 | $5,000.00 | | | |
| | | | | | | | | |
| Restoration Works | Road Deactivation | Completed | 30-45 km | N/A | | | | FRBC and P&T funded. |
| | Road Deactivation | Planned | 3 km | $5,000.00 | $5,000.00 | | | |
| | Instream | Planned | Unknown | Unknown | | Unknown | Unknown | Pending assessments |
| | | | | | | | | |
| Monitoring & Evaluations | Roads | Planned | 30-50 | $10,000.00 | $5,000.00 | $5,000.00 | | Deactivation effectiveness monitoring |
| | Instream | Planned | Unknown | Unknown | | | | Pending assessment and works |
| | | | | | | | | |
| **Sub-basin Total** | | | | $85,000.00 | $80,000.00 | $5,000.00 | $0.00 | |

| Watershed Investment Phase | Watershed Components | Status (complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ | Comments |
|---|---|---|---|---|---|---|---|---|
| **Little Cayuse Creek Sub-Basin** | | | | | | | | |
| Watershed Planning & Coordination | | Ongoing | 2500 ha | $10,000.00 | $10,000.00 | | | Restoration Plan preparation |
| | | | | | | | | |
| Assessments/ Prescriptions | Roads-SSS | Completed '99 | | | | | | MoF sponsored. |
| | Road Maintenance & Deactivation Plan | Completed '99 | Unknown | N/A | | | | FRBC and P&T funded. |
| | IWAP | Completed | 2500 ha | N/A | | | | |
| | Level II CAP | Planned | 2500 ha | $15,000.00 | $15,000.00 | | | IWAP recommendation |
| | | | | | | | | |
| Restoration Works | Road Deactivation | Completed | | | | | | FRBC and P&T funded. |
| | Instream | Planned | Unknown | Unknown | $0.00 | Unknown | Unknown | Pending assessments |
| | | | | | | | | |
| Monitoring & Evaluations | Roads | Planned | 6 | $2,400.00 | $1,200.00 | $1,200.00 | $0.00 | Deactivation effectiveness monitoring |
| | Instream-Stream Flow and Water Quality Monitoring | Completed 98-99; Planned | 195 days | $45,000.00 | $15,000.00 | $15,000.00 | $15,000.00 | MoF/P&T funded. Water quality/quantity assessment, 65 days/year; data collection used to calibrate the IWAP |
| | Instream | Planned | Unknown | Unknown | $0.00 | Unknown | Unknown | Pending assessments and works |
| | | | | | | | | |
| **Sub-basin Total** | | | | **$72,400.00** | **$41,200.00** | **$16,200.00** | **$15,000.00** | |

| Watershed Investment Phase | Watershed Components | Status (complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ | Comments |
|---|---|---|---|---|---|---|---|---|
| **Ladybird-Norns Sub-Basin** | | | | | | | | |
| Watershed Planning & Coordination | | | | | | | | |
| Assessments/ Prescriptions | Roads | Planned | 22 | $20,000.00 | $15,000.00 | $5,000.00 | $0.00 | Priority Area D done first year, then Area G & H |
| | Hillslopes | Planned | 150 | $30,000.00 | $20,000.00 | $10,000.00 | $0.00 | This includes skidding trails and slide areas |
| | Gullies | | 0 | $0.00 | $0.00 | $0.00 | $0.00 | |
| | Riparian | Planned | 4.5 | $3,750.00 | $6,000.00 | $2,000.00 | $0.00 | Upper Ladybird |
| | Instream | Planned | 2.5 | $7,500.00 | $10,000.00 | $5,000.00 | $0.00 | Upper Ladybird |
| | Fish Habitat Assessment | Planned | 40 | $12,000.00 | $0.00 | $0.00 | $3,600.00 | |
| | | | | | | | | |
| Restoration Works | Roads | Planned | 22 | $100,000.00 | $75,000.00 | $25,000.00 | $0.00 | Includes roads and skidding trails |
| | Hillslopes | Planned | 5 | $25,000.00 | $15,000.00 | $10,000.00 | $0.00 | Landslide restoration |
| | Gullies | | 0 | $0.00 | $0.00 | $0.00 | $0.00 | |
| | Riparian | Planned | 4.5 | $22,000.00 | $14,000.00 | $0.00 | $0.00 | |
| | Instream | Planned | 2.5 | $25,000.00 | $25,000.00 | $0.00 | $0.00 | |
| | | | | | | | | |
| Monitoring & Evaluations | Roads | Planned | | $6,000.00 | $3,000.00 | $1,500.00 | $1,500.00 | |
| | Hillslopes | Planned | | $4,500.00 | $1,500.00 | $1,500.00 | $1,500.00 | |
| | Gullies | | | $0.00 | $0.00 | $0.00 | $0.00 | |
| | Riparian | Planned | | $3,500.00 | $1,500.00 | $1,000.00 | $1,000.00 | |
| | Instream | Planned | | $8,000.00 | $0.00 | $4,000.00 | $4,000.00 | |
| | | | | | | | | |
| **Sub-basin Total** | | | | **$267,250.00** | **$186,000.00** | **$65,000.00** | **$11,600.00** | |
| WATERSHED UNIT TOTAL | | | | $502,650.00 | $327,200.00 | $121,200.00 | $49,600.00 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Summary of Investment Status and Estimated Budget for the Kuskanax Watershed- Slocan Forest Products (page 1 of 2) | | | | | | | |
| Date:August 29/00 | | | | | | | |
| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ |
| Watershed Planning & Coordination | | ongoing/planned | | $20,000 | $10,000 | $8,000 | $2,000 |
| **Gardner Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed- 1995 | N/A | | | | |
| | Roads- Level 2 | completed- 1999 | 24 km | | | | |
| | | | | | | | |
| Restoration Works | Roads | completed- 1999 | 24 km | | | | |
| | | | | | | | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | ongoing- 2000 | 24 km | | | | |
| | | | | | | | |
| | | Sub-basin Total | | N/A | N/A | N/A | N/A |
| **Raven Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed- 1995 | | | | | |
| | Roads- Level 2 | planned | 10 km | $5,000 | $5,000 | | |
| | Overview FHAP | planned | | $2,000 | $2,000 | | |
| | Level 1- FHAP | pending Overview results | ? | | | ? | |
| | | | | | | | |
| Restoration Works | Roads | planned | pending assessment | | | ? | |
| | Instream Works | pending Level 1 results | ? | | | | ? |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | pending assessment | | | ? | |
| | | Sub-basin Total | | $7,000 | $7,000 | ? | $0.00 |
| **Lower Residual Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed- 1995 | | | | | |
| | Roads- Level 2 | planned | 25 km | $20,000 | | $20,000 | |
| | Overview FHAP | planned | | $2,000 | $2,000 | | |
| | Level 1-FHAP | pending assessment | ? | | | ? | |
| | | | | | | | |
| Restoration Works | Roads | planned | pending assessment | ? | | | ? |
| | Instream | planned | pending assessment | ? | | | ? |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | pending assessment | ? | ? | | ? |
| | Instream | planned | pending assessment | ? | ? | | ? |
| | | Sub-basin Total | | $22,000 | $2,000 | $20,000 | $0 |
| | | Grand Total (pg 1) | | $49,000 | $19,000 | $28,000 | $2,000 |

| Summary of Investment Status and Estimated Budget for the Kuskanax Watershed- Slocan Forest Products (page 2 of 2) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date:August 30/00 | | | | | | | |
| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ |
| Watershed Planning & Coordination | | ongoing/planned | | **$10,000** | **$5,000** | **$5,000** | |
| **Benton Sub-basin** | | | | | | | |
| | Level 1- Road Overview | completed-1995 | N/A | | | | |
| | Level 2- Roads | planned | 15 km | $10,000 | $10,000 | | |
| | Overview FHAP | planned | N/A | $2,000 | $2,000 | | |
| | Level 1- FHAP | pending assessment | ? | | | ? | |
| | | | | | | | |
| Restoration Works | Roads | pending assessment | ? | ? | | ? | |
| | Instream | pending assessment | ? | ? | | | ? |
| | | | | | | | |
| Monitoring & Evaluations | Roads | pending assessment | ? | $2,000 | | | $2,000 |
| | | **Sub-basin Total** | | **$14,000** | **$12,000** | **$0** | **$2,000** |
| **Upper Residual Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed-1995 | | | | | |
| | Roads- Level 2 | planned | 10 km | $5,000 | | $5,000 | |
| | Overview FHAP | planned | N/A | $2,000 | $2,000 | | |
| | Level 1- FHAP | pending assessment | ? | | | | |
| | | | | | | | |
| Restoration Works | Roads | pending assessment | ? | ? | ? | | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | pending assessment | ? | ? | | | ? |
| | | **Sub-basin Total** | | **$7,000** | **$2,000** | **$5,000** | **$0** |
| **Upper Kuskanax Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed-1995 | N/A | | | | |
| | Fish Inventory | completed-1997 | N/A | | | | |
| | Roads- Level 2 | completed-1996 | 13 km | N/A | $0 | | |
| | | | | | | | |
| Restoration Works | Roads | planned | 13 km | $40,000 | $40,000 | | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 13 km | $2,000 | | $2,000 | |
| | | **Sub-basin Total** | | **$42,000** | **$40,000** | **$2,000** | **$0** |
| **Friedenberger Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed-1995 | N/A | | | | |
| | Roads- Level 2 | planned | 5 km | $2,000 | | $2,000 | |
| | Fish Inventory | completed-1997 | N/A | | | | |
| | Overview FHAP | planned | N/A | $2,000 | $2,000 | | |
| | | | | | | | |
| Restoration Works | Roads | planned | pending assessment | ? | | | ? |
| | Instream | planned | pending assessment | ? | | ? | |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | pending assessment | ? | | | |
| | | **Sub-basin Total** | | **$4,000** | **$2,000** | **$2,000** | **$0** |
| **Wood / Newbrant / Rogers Sub-basins** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed-1995 | N/A | | | | |
| | | | | | | | |
| Restoration Works | Roads | N/A | not eligible | | | | |
| | Instream | N/A | not eligible | | | | |
| | | | | | | | |
| | | Grand Total (pg 2) | | $77,000 | $61,000 | $14,000 | $2,000 |
| | | WATERSHED TOTAL | | $126,000 | $80,000 | $42,000 | $4,000 |

**Summary of Investment Status and Estimated Budget for Target Watershed KL-18 (Coffee, Lendrum, Woodbury) Meadow Creek Cedar**

Date: August 14, 2000

| Watershed Investment Phase | Watershed Components | Status (complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ | Comments |
|---|---|---|---|---|---|---|---|---|
| Watershed Planning & Coordination | Restoration Plan | planned | | $5,000 | $5,000 | | | |
| **Coffee Sub-Basin** | | | | | | | | |
| Assessments/ Prescriptions | Roads-overview | planned | | $10,000 | | $10,000 | | |
| | Roads-Level II prescriptions | planned | 10 to 20km | $8,000 | | $8,000 | | |
| | Hillslopes-overview | planned | | $5,000 | | $5,000 | | |
| | Riparian-overview | planned | | $5,000 | | $5,000 | | |
| | Instream-overview | planned | | $5,000 | | $5,000 | | |
| | | | | | | | | |
| Restoration Works | Roads | pending assessment | 10-20 km | $20,000 | | $20,000 | | |
| | Hillsides | pending assessment | | ? | | | | |
| | Riparian | pending assessment | | ? | | | | |
| | Instream | pending assessment | | ? | | | | |
| | | | | | | | | |
| Monitoring & Evaluations | Roads | ongoing | 40-50 km | $15,000 | $5,000 | $5,000 | $5,000 | |
| | Hillsides | | | | | | | |
| | Riparian | | | | | | | |
| | Instream | planned | | $10,000 | | $5,000 | $5,000 | |
| **Sub-basin Total** | | | | **$83,000** | **$10,000** | **$63,000** | **$10,000** | |

| **Lendrum Sub-basin** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Assessments/ Prescriptions | Roads-Overview | planned | | $5,000 | | $5,000 | | |
| | Roads-Level II prescriptions | planned | 10 to 15km | $7,500 | | | $7,500 | |
| | Hillslopes-overview | planned | | $5,000 | | $5,000 | | |
| | Riparian-overview | planned | | $5,000 | | $5,000 | | |
| | Instream-overview | planned | | $5,000 | | $5,000 | | |
| | | | | | | | | |
| Restoration Works | Roads | pending assesment | 10 to 15km | $20,000 | | | $20,000 | |
| | Hillsides | pending assesment | 2 ha | $15,000 | | | $15,000 | A large slide off of road 1.6.2a may need some additional rehabilitation |
| | Gullies | pending assesment | | | | | | |
| | Riparian | pending assesment | | | | | | |
| | Instream | pending assesment | | | | | | |
| | | | | | | | | |
| Monitoring & Evaluations | Roads & hillsides | planned | 10-15 km | $15,000 | $5,000 | $5,000 | $5,000 | |
| | Instream | pending assesment | | $5,000 | | | $5,000 | |
| **Sub-basin Total** | | | | **$165,500** | **$15,000** | **$88,000** | **$62,500** | |

Summary of Investment Status and Estimated Budget for Target Watershed KL-8 (Trout Lake sub-basins) Meadow Creek Cedar

14-Aug-00

| Watershed Investment Phase | Watershed Components | Status (complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ | Comments |
|---|---|---|---|---|---|---|---|---|
| **Trout Lake sub-basins MCC operating area** | | | | | | | | |
| **Laughton, 9Mile, Rady, Stobart, Neil, American, Horsefly** | | | | | | | | |
| Watershed Planning & Coordination | Restoration Plan | planned | | $10,000 | $10,000 | | | |
| | | | | | | | | |
| | Roads-Level II prescriptions | planned | 28 km | $10,000 | $10,000 | | | |
| | Hillsides | complete | | | | | | |
| | Gullies | complete | | | | | | |
| | Riparian | n/a | | | | | | |
| | Instream | n/a | | | | | | |
| | | | | | | | | |
| Restoration Works | Roads | planned | 28 km | $25,000 | $10,000 | $15,000 | | |
| | | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 28 km | $2,000 | | $2,000 | | |
| **Sub-basin Total** | | | | **$47,000** | **$30,000** | **$17,000** | **$0** | |

| **Woodbury Sub-Basin** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Assessments/ Prescriptions | Roads-Overview | planned | 20 to 40km | $15,000 | | $15,000 | | |
| | Roads-Level II prescriptions | planned | 20-40 km | $10,000 | | | $10,000 | |
| | Hillsides | planned | | $5,000 | | $5,000 | | |
| | Gullies | planned | | $5,000 | | $5,000 | | |
| | Riparian | planned | | $5,000 | | $5,000 | | |
| | FHAP overview | planned | | $10,000 | | $10,000 | | |
| | | | | | | | | |
| Restoration Works | Roads | pending assesment | 20 km | $20,000 | | | $20,000 | |
| | Hillsides | pending assesment | | | | | | |
| | Gullies | pending assesment | | | | | | |
| | Riparian | pending assesment | | | | | | |
| | Instream | pending assesment | | | | | | |
| | | | | | | | | |
| Monitoring & Evaluations | Roads & Hillsides | planned Year 4 | | $5,000 | | | | |
| | Instream | planned Year 4 | | $5,000 | | | | |
| **Sub-basin Total** | | | | **$80,000** | **$0** | **$40,000** | **$30,000** | |

|  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
| **Trout Lake sub-basins SFP operating area** |  |  |  |  |  |  |  |  |
| **Abrahamson, Benson, Craig** |  |  |  |  |  |  |  |  |
| Watershed Planning & Coordination | Restoration Plan | planned |  | $5,000 | $5,000 | $0 |  |  |
| Assessments/ Prescriptions | Roads-Overview | planned |  | $15,000 |  | $15,000 |  |  |
|  | Roads-Level II prescriptions | planned | 20-30 km | $15,000 |  |  | $15,000 |  |
|  | Hillsides-Overview | planned |  | $5,000 |  | $5,000 |  |  |
|  | Gullies-overview | planned |  | $5,000 |  | $5,000 |  |  |
|  | Riparian-overview | planned |  | $5,000 |  | $5,000 |  |  |
|  | Instream-FHAP overview | planned |  | $5,000 |  | $5,000 |  |  |
|  |  |  |  |  |  |  |  |  |
| Restoration Works | Roads | pending assesment | 20-30 km | $20,000 | $0 |  | $20,000 |  |
|  | Hillsides | pending assesment |  |  |  |  |  |  |
|  | Gullies | pending assesment |  |  |  |  |  |  |
|  | Riparian | pending assesment |  |  |  |  |  |  |
|  | Instream | pending assesment |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Monitoring & Evaluations | Roads | pending assesment | 20-30 km | $5,000 |  |  | $5,000 |  |
|  | Hillsides | pending assesment |  |  |  |  |  |  |
|  | Gullies | pending assesment |  |  |  |  |  |  |
|  | Riparian | pending assesment |  |  |  |  |  |  |
|  | Instream | pending assesment |  |  |  |  |  |  |
| **Sub-basin Total** |  |  |  | **$80,000** | **$5,000** | **$35,000** | **$40,000** |  |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Summary of Investment Status and Estimated Budget for the Wilson Watershed- Slocan Forest Products (page 1 of 2)** | | | | | | | |
| Date:August 9/00 | | | | | | | |
| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ |
| **Wilson Sub-basin** | | | | | | | |
| Watershed Planning & Coordination | | ongoing/planned | | **$20,000** | **$10,000** | **$10,000** | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed | N/A | | | | |
| | Roads- Level 2 | ongoing/planned | 30 km | $40,000 | $20,000 | $20,000 | 0 |
| | Overview FHAP | completed | N/A | | | | |
| | Instream- Level 1 FHAP | ongoing | 3 reaches | $5,000 | $5,000 | 0 | 0 |
| | | | | | | | |
| Restoration Works | Roads | ongoing/ planned | 30 km | $40,000 | $20,000 | $20,000 | 0 |
| | Instream- Level 1 FHAP | planned | pat | ? | ? | 0 | 0 |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 30 km | $5,000 | $5,000 | 0 | 0 |
| | Instream | planned | pending assessment | ? | ? | 0 | 0 |
| | | **Sub-basin Total** | | **$100,000** | **$60,000** | **$40,000** | **$0.00** |
| **Harlow Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed | | | | | |
| | Roads- Level 2 | planned | 20 km | $10,000 | 0 | $10,000 | 0 |
| | Overview FHAP | completed | | | | | |
| | | | | | | | |
| Restoration Works | Roads | planned | pending assessment | ? | ? | 0 | 0 |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | pending assessment | ? | ? | | |
| | | **Sub-basin Total** | | **$10,000** | **$0** | **$10,000** | **$0.00** |
| **Fitzstubbs Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed | | | | | |
| | Roads- Level 2 | planned | 25 km | $20,000 | 0 | $20,000 | 0 |
| | Overview FHAP | completed | N/A | | | | |
| | Instream-Level 1 FHAP | ongoing | 2 reaches | $5,000 | $5,000 | 0 | 0 |
| | | | | | | | |
| Restoration Works | Roads | planned | pending assessment | ? | ? | 0 | 0 |
| | Instream | planned | pending assessment | ? | ? | 0 | 0 |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | pending assessment | ? | ? | | |
| | Instream | planned | pending assessment | ? | ? | | |
| | | **Sub-basin Total** | | **$25,000** | **$5,000** | **$20,000** | **0** |
| | | **Grand Total (pg 1)** | | **$155,000** | **$75,000** | **$80,000** | **0** |

| Summary of Investment Status and Estimated Budget for the Wilson Watershed- Slocan Forest Products (page 2 of 2) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date:August 9/00 | | | | | | | |
| Watershed Investment Phase | Watershed Components | Status( complete, ongoing, planned) | Estimated Outputs to complete ( Ha. or Km) | Estimated Budget to complete | Year 1 (2001-2002) $ | Year 2 (2002-2003) $ | Year 3 (2003-2004) $ |
| **Bremner Sub-basin** | | | | | | | |
| Watershed Planning & Coordination | | ongoing/planned | | **$10,000** | **$5,000** | **$5,000** | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed | N/A | | | | |
| | Roads- Level 2 | completed | 16.5 km | $0 | $0 | $0 | 0 |
| | Overview FHAP | completed | N/A | | | | |
| | | | | | | | |
| Restoration Works | Roads | completed | 16.5 km | $0 | $0 | $0 | 0 |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 16.5 km | $2,000 | $2,000 | 0 | 0 |
| | | **Sub-basin Total** | | **$7,000** | **$7,000** | **$0** | **$0.00** |
| **Ranch Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed | | | | | |
| | Roads- Level 2 | completed | 10 km | $0 | 0 | $0 | 0 |
| | Instream-Level 1 FHAP | ongoing | 2 reaches | $5,000 | $5,000 | 0 | 0 |
| | Overview FHAP | completed | N/A | | | | |
| | | | | | | | |
| Restoration Works | Roads | planned | 10 km | $15,000 | $15,000 | 0 | 0 |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | 10 km | $2,000 | 0 | $2,000 | 0 |
| | | **Sub-basin Total** | | **$22,000** | **$20,000** | **$2,000** | **0** |
| **Hamling Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed | 11 km | | | | |
| | Roads- Level 2 | planned | 11 km | $5,000 | $5,000 | $0 | 0 |
| | Overview FHAP | completed | N/A | | | | |
| | | | | | | | |
| Restoration Works | Roads | planned | pending assessment | ? | ? | 0 | 0 |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | pending assessment | ? | ? | 0 | 0 |
| | | **Sub-basin Total** | | **$5,000** | **$5,000** | **$0** | **0** |
| **Monitor Sub-basin** | | | | | | | |
| Assessments/ Prescriptions | Level 1- Road Overview | completed | 30 km | | | | |
| | Roads- Level 2 | planned | 30 km | $15,000 | $15,000 | $0 | 0 |
| | Overview FHAP | completed | N/A | | | | |
| | | | | | | | |
| Restoration Works | Roads | planned | pending assessment | ? | ? | 0 | 0 |
| | | | | | | | |
| Monitoring & Evaluations | Roads | planned | pending assessment | ? | ? | 0 | 0 |
| | | **Sub-basin Total** | | **$15,000** | **$15,000** | **$0** | **0** |
| | | | | | | | |
| | | **Grand Total (pg 2)** | | **$59,000** | **$52,000** | **$7,000** | **0** |
| | | **WATERSHED TOTAL** | | **$214,000** | **$127,000** | **$87,000** | **$0** |

# INTERIM RESTORATION PLAN for the LUSSIER RIVER WATERSHED

Prepared by:

Crestbrook Forest Industries Ltd./Tembec
(MYA #0000203)

Prepared for:
Forest Renewal BC

FOREST
RENEWAL BC

September 1, 2000

## 1.0 INTRODUCTION

Lussier River is a major tributary to the Kootenay River. The watershed has a history of forest fire disturbance, forest development including extensive fire salvage logging, and mining primarily in the upper reaches of the river, as well as agricultural development in the lower 12 km of the river. The Lussier supports a significant fishery. It is a watershed unit (GIS Tag # SMAR 05000003) identified as a priority for inventory and restoration through the Kootenay/Boundary Region EEV-RMP planning process due to its highly valued fisheries habitat.

This interim Restoration Plan (RP) for Lussier River describes watershed conditions and known or suspected critical limiting factors for fish productivity. The interim RP summarizes the restoration related work that has been done to date in the watershed, and based on a cursory "gap analysis" of what additional assessments or works may be required to address (or better identify) limiting factors, it identifies potential future restoration initiatives. A tentative implementation plan outlines the anticipated timelines and budget for these initiatives, although the figures represent only a "best guess" at this preliminary stage of restoration planning.

A fully developed Restoration Plan would:

- identify the critical limiting factors affecting fish;
- identify the components targeted for restoration;
- describe the sub-basin, component, and site level restoration objectives;
- identify the proposed restoration activities and sites;
- provide a schedule of works (over 5 years) and budget estimate; and
- describe a monitoring and evaluation plan.

## 2.0 DESCRIPTION OF WATERSHED

The Lussier River is an East side tributary to the Kootenay River, located in the front ranges of the Rocky Mountains between the communities of Canal Flats (to the north) and Skookumchuk (at the mouth). The Lussier is a 4th order stream that drains an area approximately 600 km$^2$ in size, with several third order or greater tributaries including Diorite Creek, Marmalade Creek, Roam Creek, Ram Creek, Mutton Creek, Coyote Creek, and Nichol Creek. The mainstem Lussier is approximately 85 km long, and it describes an inverted U-shape that first extends north (reaches 10-13 approx. 37 km long) from its headwaters to its confluence with Coyote Creek, then becomes confined as it turns to the west and south (reaches 7-9 approx. 14 km long), then finally flows south to join the Kootenay River (reaches 1-6 approx. 34 km long). The headwaters of Lussier River are located within the Top of the World Provincial Park and the Coyote and Nichol Creek sub-basins, with height-of-land elevations of approximately 3100 meters above sea level (m asl). The mouth of the Lussier near Skookumchuk, BC is at 150 m asl.

Several species of fish are either known or suspected in the Lussier watershed, including bull trout, westslope cutthroat trout, rainbow trout, eastern brook trout, and kokanee. Non-sport fish in the system include longnose dace, sculpins, and suckers. The non-native rainbow and brook trout are thought to occur mostly in lakes in the system as well as in Coyote Creek, while kokanee are known to spawn in the lower mainstem and their presence is also suspected in Coyote Creek. Bull trout and cutthroat are the target salmonid species in the system, and both are thought to be present throughout the mainstem and headwaters including Nichol Creek and Fish Lake. Preliminary FHAP results suggest that the Lussier may support resident, fluvial, and adfluvial populations of bull trout.

A total of approximately 184 $km^2$ (33%) of the watershed has been disturbed by fire, salvage logging, and other forest development activities concentrated in the upper Lussier over the past few decades (AGRA 2000). Approximately 13,000 hectares or 13 $km^2$ of the watershed was burned in the 1985 Ram fire which started in Ram Creek and spread into the upper Lussier and Coyote Creek. Subsequent wood salvage operations produced an extensive network of roads and trails over about 25% of the burned area. It is estimated that about 50% of the burned area was planted with a mix of tree species, while 35% was left to natural regeneration (the remainder of the area being exposed rock).

There are two provincial parks located within the drainage area, Premier Lake and the larger (28.2 $km^2$) Top of the World, with Whiteswan Provincial Park located adjacent to the northeast watershed boundary.

## 3.0 INVENTORY & RESTORATION RELATED WORK TO DATE

- Mutton Creek Level I Road Assessment (Columbia Environmental Services 1996)
- Mutton Creek Road Deactivation Prescriptions and Major Works (Crestbrook Forest Industries/FRBC, 1997)
- Lussier River Level I Road Assessment and Sediment Source Survey (Columbia Environmental 1997)
- Lussier River Level II Road Assessment and Sediment Source Survey (Interior Reforestation 1998)
- Level D Terrain Stability Assessment (Banting 1998)
- Interior Watershed Assessment Procedure (IWAP) for Bradford, Nichol, Coyote, Blackfoot, and Thunder Creek Watersheds (Interior Reforestation 1998)
- Watershed Restoration Overview Road and Block Assessment (Kaljon 1998)
- Integrated Watershed Restoration Plan - Canal Flats Operating Area (Interior Reforestation 1999)
- Watershed Overview Assessment Stream Crossing Inventory – Canal Flats Operating Area (Interior Reforestation 1999)
- Elk and Lussier Prescription Review (Kaljon 1999)
- Level III Major Works Lussier River (1999)

- Road Stability Field Assessment – Lussier River Road Deactivation (Nisus Resource Management 2000)
- Level III Major Works Lussier River (2000)
- Fish passage culvert inspection – preliminary mapping and reconnaissance field inspection notes (CFI-FRBC 2000)
- Overview Fish Habitat Assessment of the Lussier River Watershed, British Columbia (AGRA July 2000 Draft)

In 1997 CFI completed FRBC-funded road deactivation of the non-status road network (approximately 10 km of roads) in Lussier tributary Mutton Creek. This work addressed erosion and sedimentation concerns along the roads and problematic creek crossings (i.e. culverts were replaced with fords, etc.) The cutblocks in this drainage were assessed to be mostly stable with no indications of existing or potential slope failures.

The upper Lussier (i.e. the mainstem Lussier upstream of Coyote Creek), including Nichol Creek sub-basin, has been the focus of the majority of FRBC restoration work that has been undertaken to date in the watershed. A Level I Road Assessment and Sediment Source Survey undertaken in 1997 addressed a total of 175 km of roads in the upper Lussier. In 1998 detailed prescriptions (Level II Assessment) for road deactivation were developed for approximately 50 km of the higher priority roads identified in 1997. In 1999 CFI implemented the prescriptions completed for the highest priority roads, and concurrently re-assessed the remaining roads identified both at Level I and Level II to be "priority" roads with the aim on keying in on potential environmental concerns (vs. access or site productivity concerns, which were previously included in WRP objectives). Finally, in 2000 CFI completed assessment and major works in the upper Lussier, having addressed all identified sediment source concerns (i.e. road failures near creeks, erosion at stream crossings, failing log culverts, etc.) associated with abandoned, non-status roads in the system. A total of approximately 24 km of roads were deactivated to semi-permanent to permanent levels with residual access depending on site conditions and other user's access needs, normally 4x4 or ATV access.

In addition to the FRBC-funded rehabilitative work performed in Mutton Creek, Nichol Creek and the upper Lussier, CFI has completed standard deactivation measures on operational roads and reclaimed cutblock skid trails elsewhere in the Lussier watershed including Coyote Creek.

Components of an Integrated Watershed Restoration Plan were completed by Interior Reforestation in 1998 for specific drainages in CFI's Canal Flats operating area. While these field assessments did not address the majority of the Lussier watershed, they did include portions of the lower Lussier (east side only, from Ram Creek to 10 km north) and Coyote Creek (upper middle section of the sub-basin, contained within 1:20,000 mapsheet 82G.093). Erosion and mass wasting risk assessment (EMRA) and stream crossing inventory was completed in these areas, with a focus only on those forest roads and associated features or structures (e.g. gullies, landslides, fireguards, culverts, bridges, etc.) considered to be eligible for FRBC funded restoration works. The stream inventory work done under separate contract but in conjunction with the EMRA focused on identifying potential environmental concerns at stream crossings, including possible fish barriers at culverts.

Interior Reforestation assessed a total of 150 km of roads in the upper Coyote drainage, with GPS data points and observations summarized in map, spreadsheet, and text form. Interior Reforestation reported that an extensive road deactivation program previously undertaken in the study area had proven to be very successful, although additional "seasonal deactivation measures" were needed in the southeastern portion of the area. Identified concerns or recommended measures such as the need for maintaining or constructing additional waterbars, or rehabilitating landings, all were rated either as "low" or "low-moderate" priorities for future work. A total of approximately 23 km of roads were assessed in the lower Lussier area, with similar results as for Coyote Creek. Maintenance and additional construction of specific road deactivation/drainage structures was rated to be of low to moderate priority. There were no identified fish passage concerns, while concerns related to road erosion at four non-fish stream crossings resulted in recommendations (low priority) for installing or improving fords at these sites.

Preliminary assessment of stream crossings with potential fish passage barriers in the Lussier River watershed indicates that there are 3 sites on the upper Lussier and 1 on the lower Coyote where a full Fish Passage Culvert Inspection (FPCI) procedure should be performed.

An Interior Watershed Assessment Procedure (IWAP) completed in 1998 addressed the Nichol Creek and Coyote Creek sub-basins of Lussier River. The densities of roads and stream crossings were the main concerns identified in both drainages, while in Coyote Creek alone the Equivalent Clearcut Area (ECA) was a significant concern. Road deactivation measures completed to date in both drainages are likely to have addressed many of the underlying concerns associated with these IWAP indicators (i.e. altered surface hydrology, surface erosion and stream sedimentation, etc.) and accelerated watershed recovery.

The Overview Fish Habitat Assessment was undertaken in spring 2000 to collect existing fisheries and related information for Lussier River, identify target fish species and their preferred habitats by life stage, preliminarily assess habitat conditions, identify concerns or limiting factors, and suggest possible rehabilitation strategies including restorative and mitigative measures. Although the study remains incomplete, draft findings and recommendations indicate that further assessment and possible restorative works should be considered for the length of Coyote Creek (30.5 km), the length of Nichol Creek (11.1km), and select reaches of both the lower and upper Lussier mainstem (30.7 km total). Riparian function assessment and restoration is suggested for some of these reaches, while channel assessment in conjunction with fish habitat assessment (Level I FHAP) and possible instream works is suggested for others. As a first order priority, any upslope areas not yet assessed for sediment source contributions should be addressed to reduce sediment loading to the system.

## 4.0 RESTORATION OBJECTIVES

Watershed restoration initiatives are concerned with the recently redefined FRBC program objectives referred to as Enhanced Environmental Values (EEV). Accelerated recovery of the Lussier River watershed will require the implementation of works designed to help maintain and/or restore currently unidentified critical limiting habitat conditions for bull and cutthroat trout in the system.

The watershed level restoration objectives for the Lussier River are to:

- reduce sediment delivery from hillslopes to the mainstem and major tributaries
- restore a functional, conifer-dominated riparian forest
- maintain or restore rearing, holding, and spawning habitat for bull and cutthroat trout

The primary watershed components for upslope restoration in the Lussier are landslides, roads, and gullies. The component level objectives for landslide rehabilitation are to:

- stabilize active landslide scars to reduce the direct deposit of sediments to major streams
- prevent stream erosion of the toe of landslides so they may start the stabilization process

The component level objectives for road deactivation in Lussier River watershed are to:

- reduce the volume of sediment generated from roads and trails
- restore hillslope drainage networks

The component level objectives for gullies in Lussier River watershed are to:

- reduce the volume of sediment generated from gullies that originated from road washouts.

The secondary watershed component for restoration in the Lussier is riparian. The wide scale burning and subsequent salvage logging of riparian forest likely has compromised riparian function in the system. Recruitment of LWD to these stream channels is expected to be limited over the next 50-75 years. Re-establishment of a conifer-dominated riparian forest will over the long term lead to both improved bank stability, reduced sedimentation, and improved rearing habitats by providing a LWD recruitment source.

The component level objectives for riparian restoration in the Lussier are to:

- improve stream bank stability through promoting revegetation, and particularly regeneration of conifers, in the riparian reserve zone
- accelerate the recovery of mature conifers for future recruitment of large woody debris to the stream channel
- promote the general recovery of other "riparian functions", including stream shading, provision of nutrients to the stream, provision of wildlife habitat, etc.

The tertiary watershed component for possible restoration in the Lussier River watershed is fisheries habitat. The component level objectives for fish habitat restoration in the Lussier would be to:

- promote the revegetation of the riparian reserve zone to improve stream bank stability, water quality, and other riparian functions related to fish habitat conditions including stream shading and provision of nutrients
- promote the long term recovery of LWD function in the stream channel by way of ensuring recruitment of LWD sources (primarily conifers)
- provide in the short term LWD function in the stream channel by way of introducing LWD (i.e. instream structures) designed to address as yet unidentified limiting factors for juvenile and adult salmonids

## 5.0 INTERIM RESTORATION PLAN SCHEDULE

The following table summarizes the preliminary scope and schedule for possible restoration initiatives in the Lussier River drainage. The plan is intended to be iterative in nature, as it is based on a currently limited amount of available information.

| WATERSHED COMPONENT | RESTORATION INITIATIVE | TIMING | EST. COST * see note |
|---|---|---|---|
| **Watershed** | Restoration Planning – compile series of historical airphotos to assess channel changes over time and relative to disturbance events | September 2000 | $15,000 |
| | Channel Conditions Assessment & Prescriptions – components of IWAP to be done for most of Lussier mainstem plus Coyote Cr. and Nichol Cr. tributaries (approx. 120 km of stream channel) | 2001 | <$100,000 |
| | Access management planning (required prior to any further road deactivation work) involving referral and consultation | 2000/2001 | $10,000 |
| | | | |
| **Upslope** | Assess potential for bioengineering treatment at locations identified in 1999 | October 2000 | $5,000 |
| | Possible bioengineering works | Oct/Nov 2000 | $20,000 |
| | Effectiveness evaluation of completed upslope works in Nichol Cr. sub-basin, upper Lussier, upper Coyote Cr. | Spring 2001 | $5,000 |
| | Level I Upslope Assessment – lower Coyote Creek sub-basin | Summer 2001 | $10,000 |
| | Upslope prescriptions (Level II) – Coyote | Fall 2001 | <$20,000 |
| | Upslope works (Level III) – Coyote | July/Aug 2002 | <$100,000 |
| | Effectiveness evaluation of completed | 2003 | $4,000 |

| | | | |
|---|---|---|---|
| | upslope works | | |
| | | | |
| **Riparian** | Riparian/channel stability field assessment of Lussier reaches 9 & 10 (17km of channel, or approx.70 hectares) by multi-disciplinary team; place order for any seedling stock required in 2002 | October 2000 | $25,000 |
| | Riparian/channel stability field assessment of Coyote Creek by multi-disciplinary team (max. 30.5 km of channel, approx. 120 hectares); place order for any seedling stock required in 2003 | Summer 2001 | $50,000 |
| | Riparian treatment (site prep.? approx. $600/ha for brushing, alder girdling) in reaches 9 & 10 Lussier mainstem | 2001 | <$42,000 |
| | Riparian treatment (site prep.? approx. $600/ha for brushing, alder girdling) in Coyote Creek | 2001 or 2002 | <$72,000 |
| | Riparian planting (approx. $2,000/ha) in reaches 9 & 10 Lussier mainstem | 2002 | <$140,000 |
| | Riparian planting (approx. $2,000/ha) in Coyote Creek | 2003 | <$240,000 |
| | Effectiveness evaluation of riparian restoration works | 2004 | $10,000 |
| | | | |
| **Instream** | Level I FHAP Nichol Cr. Reach 1 (7 km) | 2001 | <$10,000 |
| | Level I FHAP Coyote Cr. (30 km) | 2001 | <$50,000 |
| | Level I FHAP Lussier Reach 10 (11 km) | 2001 | <$15,000 |
| | FPCI Assess 4 culverts and habitat | 2001 | $5,000 |
| | FPCI Stream Crossing Rehabilitation | 2001 or 2002 | <$200,000 |
| | Possible prescriptions (Level II FHAP) for instream works in priority areas | 2002 | <$100,000 |
| | Possible instream works | 2003 and 2004 | <$200,000 |
| | Effectiveness evaluation/monitoring of completed instream works | 2003, 2004, 2005 | <$30,000 |

**NOTE: Project scope and budget projections are expected to be significantly improved or defined following the multi-disciplinary field assessments planned for October 2000, the successful completion of the Overview FHAP currently in progress, and following each successive level of assessment (e.g. watershed CCAP, Level I FHAPs, etc.)*

# INTERIM RESTORATION PLAN
# for the
# MATTHEW CREEK WATERSHED

**Prepared by:**

Crestbrook Forest Industries Ltd./Tembec
(MYA #0000203)

**Prepared for:**
Forest Renewal BC

September 1, 2000

## 1.0 INTRODUCTION

Matthew Creek is a designated community watershed for the town of Marysville, BC. The watershed has a history of domestic water supply, forest development, and forest fire disturbance. Matthew Creek supports a significant fishery. It is a watershed unit (GIS Tag # SMAR 04000011) identified as a priority for inventory and restoration through the Kootenay/Boundary Region EEV-RMP planning process due to its very high values both in terms of water supply and fisheries habitat.

This interim Restoration Plan (RP) for Matthew Creek describes watershed conditions and known or suspected critical limiting factors for water quality and fish habitat. The interim RP summarizes inventory and restoration related work that has been done to date in the watershed, and based on a cursory "gap analysis" of what additional assessments or works may be required to address (or better identify) limiting factors, it identifies potential future restoration initiatives. A tentative implementation plan outlines the anticipated timelines and budget for these initiatives, although the budget projections represent only a "best guess" at this preliminary stage of restoration planning.

A fully developed Restoration Plan would:

- identify the factors limiting water quality;
- identify the critical limiting factors affecting fish;
- identify the components targeted for restoration;
- describe the sub-basin, component, and site level restoration objectives;
- identify the proposed restoration activities and sites;
- provide a schedule of works (over 5 years) and budget estimate; and
- describe a monitoring and evaluation plan.

## 2.0 DESCRIPTION OF WATERSHED

Matthew Creek is a 5th order watershed with a total of 270.53 km of stream channel that drains an area approximately 154.7 km$^2$ in size, based on TRIM mapping (mapsheets 82F069, 070, 079, 080). Water quantity/quality monitoring reports suggest that the drainage is slightly smaller at approximately 15,160 hectares in size, of which 14,800 ha are located above the hydrometric station that has been operated since 1989. The average peak flow for the period of record is 29 m$^3$/sec, with the largest recent peak flow event having occurred in 1996. The Matthew Creek watershed can be divided into four main sub-basins: the lower mainstem, the west fork (upper mainstem), the middle fork (further sub-divided into left and right forks), and the east fork. Elevation in the drainage ranges from 940 metres above sea level at the confluence with St. Mary's River to 2760 m asl at the headwaters of the middle fork sub-basin, the highest point in the drainage.

Matthew Creek is designated as a community watershed and serves as the primary domestic water supply for the community of Marysville, BC. An intake structure has been installed in the lower mainstem of Matthew Creek. Two additional water licenses for irrigation and domestic purposes are also registered on the lower mainstem.

Forest development is the primary industrial use within the watershed. Crestbrook Forest Industries Ltd. (CFI) currently is operating in the lower watershed. CFI has calculated that a total of about 7,150 hectares (just less than half the drainage area) is operable land. A number of mining claims have recently been staked in the west fork sub-basin, and traplines are also registered in the drainage.

In 1985 a large forest fire burned a significant portion of the northeast part of the watershed. This fire had a direct effect on access and development planning; however, a hydrological study conducted by Gluns and Toews (1989) determined there were minimal changes in water quality following the fire.

Matthew Creek supports a substantial population of two salmonid species, westslope cutthroat trout and bull trout. Both of these species were found widely distributed throughout the watershed in the mainstem as well as third order and larger sub-basins. Stream size, barriers, and extreme gradient limit the upstream distribution of cutthroat and bull trout.

## 3.0 INVENTORY & RESTORATION RELATED WORK TO DATE

- Matthew Creek Terrain Interpretation (TSIL B) W.H Wells et. al. 1998
- Level I Interior Watershed Assessment Procedure Final Draft Report (Crestbrook Forest Industries Ltd. , 1997)
- Timber Stocking and Sediment Source Survey Supplemental Report to the Draft Summary of the Level I Interior Watershed Assessment Procedure (Interior Reforestation 1998)
- Matthew Creek Channel Assessment Procedure (Apex Geoscience Consultants Ltd., 1999 a)
- Matthew Creek Water Resource Inventory (Nanrich Water Management Consultants 1998, 1999)
- Reconnaissance Fish and Fish Habitat Inventory of Matthew and Kimberley Creek Watersheds (Artech 1999)
- Level II Sediment Source Survey and Prescription (Apex Geoscience Consultants Ltd. 1999 b)
- Reclamation Activities Matthew Creek Mainstem (Interior Reforestation Ltd, 1999).
- Toe Protection of Slope Instabilities, Matthew Creek Sites 2 & 4 (M. Miles & Associates Ltd., 2000 a)
- Toe Protection of Slope Instabilities, Matthew Creek Sites 2 & 4 – Results of Field Inspection (M. Miles & Associates Ltd., 2000 b).

The mainstem sub-basin has been the focus of the majority of the restoration work that has taken place to date in Matthew Creek. Several natural and forest development-related slides have occurred on the steep valley walls of the mainstem. The valley walls are coupled (i.e. directly connected) with the stream channel throughout this reach. While both a modified Sediment Source Survey (1998) and a Channel Assessment Procedure (1999 a) identified sediment sources to the mainstem and tributaries (particularly the west and middle forks), these studies indicated that the most significant sediment sources were related to the lower mainstem channel.

Consistent with those findings, initial restoration activities undertaken in 1999 focused on restoring natural drainage patterns and stabilizing slopes along the mainstem channel where there was the highest risk of continued valley wall failure and reduction in water quality. Prescriptions prepared by Apex (1999 b) were implemented by Interior (1999) for CFI with FRBC funding. Project effectiveness monitoring conducted by Apex and CFI in spring 2000 confirmed that certain of the restoration works proposed by Apex either were not implemented fully or required modification. Field assessment was conducted by CFI and M. Miles & Associates (2000a, 2000b) to determine whether additional "instream work" (i.e. slope toe protection at channel edge) was required to address slope stability concerns at two of the Apex prescription sites. The M. Miles reports indicated that the completed restoration works would likely reduce erosion and expedite recovery of the sites; however, they also recommended that additional bioengineering treatments should be considered for both sites at or near the stream channel edge, as well as the (previously treated) slide surfaces.

The other sub-basins in Matthew Creek have had little assessment or restorative works completed to date. The results of CFI-FRBC reconnaissance in 1999 and 2000, Interior (1998) and Apex (1999b) all suggest that sediment source concerns are concentrated in the mainstem and to a lesser degree in the west fork of Matthew Creek. All three other sub-basins exhibit some signs of disturbance that appears to be related to the spring 1996 peak flow event. This event scoured the channels and mobilized much of the large woody debris (LWD) in the system (Apex 1999 a). Slumping has been noted along the middle fork channel approximately 2.5 km upstream of the mainstem, although despite the presence of a reclaimed skid trail above these sites the slumping does not appear to be associated with concentrated or otherwise altered drainage. The slumping more likely reflects a reduction in rooting strength and soil cohesion following the fire, combined with the significant change in side slope that occurs at the slump initiation points. (Restorative works are not anticipated at these natural disturbance sites).

The 1985 forest fire and subsequent wood salvage operations have had an adverse effect on LWD recruitment in the middle and east forks of Matthew Creek, such that a total of approximately 12 km of stream channel has a riparian zone that primarily consists of either juvenile trees or burned snags. Apex (1999a) recommended that channel restoration strategies include possible riparian planting initiatives, although a silviculture reconnaissance performed in September 2000 confirmed that the burned areas were planted in 1988. Reconnaissance revealed that the "right fork" of the middle fork was characterized by a diverse mix of coniferous and deciduous tree species including pine, spruce, balsam fir, alder, willow and cottonwood, which suggests that in terms of general riparian function and LWD recruitment the process of recovery already is underway. By contrast, the lower east fork of Matthew Creek showed little species diversity, with virtually 100% lodgepole pine regen mixed with lesser amounts of deciduous vegetation. While riparian function conceivably could be enhanced for both the middle and east fork channels by way of different stand treatments (i.e. to promote the growth of larger trees, or more trees, or a different mix of tree species), the east fork is the more likely candidate for possible restorative works.

Apex (1999 a) highlighted the lower reaches of the middle fork of Matthew Creek as the one portion of the drainage where instream rehabilitative works should be considered to reduce rates of bedload transport and promote channel stabilization in the short term. (LWD plays a reduced role in influencing channel morphology in other reaches of the middle and east forks that are bedrock controlled, or that are step-pool or cascade-pool type reaches confined by valley walls, etc). The lower 4 reaches are characterized by cascade-pool and riffle-pool morphology with minimal pools, few or non-functioning LWD accumulations and alternating degraded and aggraded sections. There is a conspicuous lack of fine bed material throughout these reaches. The lack of functioning LWD in the lower 4 km of the middle fork may result in continued bank erosion and transport of this bedload downstream.

## 4.0 RESTORATION OBJECTIVES

Watershed restoration initiatives are concerned with the recently redefined FRBC program objectives referred to as Enhanced Environmental Values (EEV). Accelerated recovery of the Matthew Creek watershed will require the implementation of works designed to maintain or restore water quality, and to help restore currently unidentified critical limiting habitat conditions for bull and cutthroat trout in Matthew Creek.

The watershed level restoration objectives for Matthew Creek are to:

- reduce sediment delivery from hillslopes to the mainstem and major tributaries of Matthew Creek.
- maintain or restore the water quality in the community water supply for the towns of Marysville and Kimberley
- maintain or restore rearing, holding, and spawning habitat for bull and cutthroat trout
- restore a functional, conifer-dominated riparian forest.

The primary watershed components for upslope restoration in Matthew Creek are landslides, roads, and gullies. The component level objectives for landslide rehabilitation in Matthew Creek are to:

- stabilize active landslide scars to reduce the direct deposit of sediments to major streams

- prevent stream erosion of the toe of landslides so they may start the stabilization process

The component level objectives for road deactivation in Matthew Creek are:

- reduce the volume of sediment generated from roads and trails
- restore hillslope drainage networks

The component level objectives for gullies in Matthew Creek are:

- reduce the volume of sediment generated from gullies that originated from road washouts.

The secondary watershed component for restoration in Matthew Creek is riparian. The wide scale burning and subsequent salvage logging of riparian forest has compromised riparian function, particularly in the middle and east forks of Matthew Creek. Recruitment of LWD to these stream channels is expected to be limited over the next 50-75 years. Re-establishment of a conifer-dominated riparian forest will over the long term lead to both improved bank stability, reduced sedimentation, and improved rearing habitats by providing a LWD recruitment source.

The component level objectives for riparian restoration in Matthew Creek are to:

- improve stream bank stability through promoting revegetation, and particularly regeneration of conifers, in the riparian reserve zone
- accelerate the recovery of mature conifers for future recruitment of large woody debris to the stream channel
- promote the general recovery of other "riparian functions", including stream shading, provision of nutrients to the stream, provision of wildlife habitat, etc.

The tertiary watershed component for possible restoration in Matthew Creek is fisheries habitat. The component level objectives for fish habitat restoration in Matthew Creek would be to:

- promote the revegetation of the riparian reserve zone to improve stream bank stability, water quality, and other riparian functions related to fish habitat conditions including stream shading and provision of nutrients
- promote the long term recovery of LWD function in the stream channel by way of ensuring recruitment of LWD sources (primarily conifers)
- provide in the short term LWD function in the stream channel by way of introducing LWD (i.e. instream structures) designed to address as yet unidentified limiting factors for juvenile and adult salmonids

## 5.0 INTERIM RESTORATION PLAN SCHEDULE

The following table summarizes the preliminary scope and schedule for possible restoration initiatives in the Matthew Creek drainage. The plan is intended to be iterative in nature, as it is based on a currently limited amount of available information.

| WATERSHED COMPONENT | RESTORATION INITIATIVE | TIMING | EST. COST<br>* see note |
|---|---|---|---|
| **Watershed** | Restoration Planning – compile series of historical airphotos, review to assess channel changes over time relative to disturbance events | September 2000 | $12,000 |
| | Access management planning (required prior to any road deactivation work) involving referral and consultation | 2000/2001 | $10,000 |
| | | | |
| **Upslope** | Complete drainage works and bioengineering iniatives started in 1999 | October 2000 | $20,000 |
| | Overview Erosion and Mass Wasting Risk Assessment for all sub-basins | October 2000 | $20,000 |
| | Upslope prescriptions (Level II) – anticipate West Fork (≤ 20 km of roads) | Summer 2001 | <$20,000 |
| | Upslope works (Level III) – anticipate only West Fork Matthew Creek | Summer 2002 | <$80,000 |
| | Effectiveness evaluation of completed upslope works | 2003 | $2,000 |
| | | | |
| **Riparian** | Riparian/channel stability field assessment by multi-disciplinary team (max. 12 km of channel, but focus on lower 3 km of East Fork, approx. 12 hectares); place order for any seedling stock required in 2002 | October 2000 | $8,000 |
| | Riparian treatment (site prep.? approx. $600/ha for brushing, alder girdling) | 2001 | <$25,000 |
| | Riparian planting (approx. $2000/ha) | 2002 | <$90,000 |
| | Effectiveness evaluation of riparian restoration works | 2003 | $3,000 |
| | | | |
| **Instream** | Channel stability/fish habitat field assessment (modifed Level I FHAP) by multi-disciplinary team (focus on Middle Fork lower 4 km) | October 2000 | $6,000 |
| | Possible prescriptions (Level II FHAP) for instream works | Summer 2001 | $20,000 ? |
| | Possible instream works involving LWD additions to Middle Fork | August 2002 | $50,000 ? |
| | Effectiveness evaluation/monitoring of completed instream works | August 2003 | $4,000 |

**NOTE: Project scope and budget projections are expected to be significantly improved or defined following the multi-disciplinary field assessments planned for October 2000*

## Table 2: Summary of Regional Priority Setting Product

**Kootenay Region WU Breakdown**

287 (Total)

| Region WU Breakdown | Number |
|---|---|
| All watershed units with some pre-Code forest harvesting (did not include Cat. 5 WUs) | 148 |
| Number of watershed units which are important producers/conservers for targeted fish species/stocks or domestic water supply | 157 |
| Number of key watersheds (i.e. VH, H values for fish/water values) | |
| Category I key watersheds | 81 |
| Category II key watersheds | 3 |
| Category IIB key watersheds | |
| Category III key watersheds | 11 |
| Category IV key watersheds | 1 |
| Category V key watersheds | 61 |
| Number of priority key watersheds | 84 |

## Table 3. Minimum Data Requirements for Watershed Units

### 3a) All Watershed Units

| MoF District | Watershed Unit # | Watershed Unit Name | Regional priority for domestic water supply (VH, H, M) | Regional priority for fish (VH, H, M) | Key watershed for region (Y/N) | (Categories I-V) Likelihood of Success | MYA # (for Ws units with active projects) | Name(s) of implementing partners | Transition Watershed (Y/N) |
|---|---|---|---|---|---|---|---|---|---|
| Arrow | SLOC_O5000002 | Wilson/Bremner | M | H | Y | H | 200 | | N |
| Arrow | LARL_O4000003 | Caribou Cr. | VH | VH | Y | H | 200 | | N |
| Arrow | UARL_0400016 | Kuskanex Cr. | VH | VH | Y | H | 200 | | N |
| Arrow | AR_28 | Ladybird | VH | H | Y | H | 212/205 | | N |
| Arrow | DUNC_03000022 | Wilkie Creek | VH | H | Y | H | 204 | | N |
| Arrow | UARL_04000018 | Mosquito Creek | M | VH | Y | H | 204 | | N |
| Arrow | AR_8 | Eagle | M | H | Y | H | 208 | | N |
| Columbia | UARL_050000004 | Akolkolex | M | H | Y | H | 215 | | N |
| Columbia | CLRH_05000002 | Esplande | M | H | Y | H | 207 | | N |
| Columbia | CLRH_05000002 | Sullivan | M | H | Y | H | 207 | | N |
| Columbia | REVL_040000019 | Jordan River | M | H | Y | H | 214 | | N |
| Columbia | RV_25 | No Name | M | H | Y | H | 204 | | N |
| Kootenay L. | KL_32 | Upper Priest | VH | VH | Y | H | 210 | | N |
| Kootenay L. | KL_23 | Blewett | VH | H | Y | H | 212/205 | | N |
| Kootenay L. | KL_8 | Trout Lake | M | H | Y | H | 209 | | N |
| Kootenay L. | KL_15 | Coffee Creek | M | H | Y | H | 209 | | N |
| Kootenay L. | KL_31 | Duck Creek | H | M | Y | H | 213 | | N |
| Kootenay L. | KL_16 | Powder/Akokli Creek | H | M | Y | H | 213 | | N |
| Kootenay L. | KOTL_04000019 | Kitchener | VH | H | Y | H | 203 | | N |
| Invermere | IN_36 | White River | M | VH | Y | H | 201 | | N |
| Invermere | COLR05000002 | Forster/Francis | VH | M | Y | H | 201 | | N |
| Cranbrook | CB_25 | Joseph Creek | VH | VH | Y | H | 952 | | N |
| Cranbrook | SMAR_04000011 | Matthew Creek | VH | VH | Y | H | 203 | | N |
| Cranbrook | ELKR_05000005 | Bighorn | M | VH | Y | H | 203 | | N |
| Invermere | SMAR_05000003 | Lussier | M | VH | Y | H | 203 | | N |
| Boundary | BD_8 | Overton/Moody | H | M | Y | H | 211 | | N |
| Boundary | BD_5 | Tuzo | M | VH | Y | H | 211 | | N |
| Boundary | KETL_04000014* | Boundary | M | H | Y | H | 211 | | N |

## Table 3. Minimum Data Requirements for Watershed Units

### 3b) 3 year forecast of expenditures per Watershed Unit

| For all WS Units with existing projects (may be expanded as per local preference) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Watershed Unit | Watershed Number | Transition Watershed (Y/N) | Subbasins Within WU | Overview Assessment | | | Prescriptions | | | Major Works | | | Effectiveness Evaluation |
| | | | | Upslope | Riparian | In-Stream | Upslope | Riparian | In-Stream | Upslope | Riparian | In-Stream | |
| Gold/Bachelor | CLRH05000015 | N | Gold | 16 | 16 | 16 | | | | 200 | 40 | 20 | 12 |
| | | N | Bachelor | 16 | 30 | 30 | | | | 360 | 40 | 20 | 4 |
| Esplande | GD18 | N | | 15 | 5 | 5 | | | | 170 | 15 | 15 | 4 |
| Coffe Creek | KL 18 | N | Coffee | 15 | 5 | 5 | 8 | | | 20 | | | 25 |
| | | N | Woodbury | 25 | 5 | 10 | 10 | | | 20 | | | 10 |
| | | N | Lendrum | 13 | 5 | 5 | 8 | | | 35 | | | 20 |
| Trout Lake | KL8 | N | hamson, Benson, C | 90 | 10 | 10 | | | | 40 | | | 10 |
| | | N | Laughton, etc | 5 | | 5 | 10 | | | 25 | | | 2 |
| Wilson | SLOC05000002 | N | Wilson | 50 | 5 | 10 | | | 40 | | | | 5 |
| | | N | Harlow | 10 | | | | | | | | | |
| | | N | Fitzstubbs | | | 5 | 20 | | | | | | |
| | | N | Bremner | 5 | | 5 | | | | | | | 2 |
| | | N | Ranch | | | 5 | | | | 15 | | | 2 |
| | | N | Hamling | 5 | | | | | | | | | |
| | | N | Monitor | | | | 15 | | | | | | |
| Deer/Ladybird/Cayuse | AR-28 | N | Syringa | | | | | | | | | | 13 |
| | | N | Deer | | | 30 | | | | | | 25 | 10 |
| | | N | Cayuse | 5 | 5 | 60 | | | | 5 | | | 10 |
| | | N | Little Cayuse | 5 | 5 | 20 | | | | | | | 3 |
| | | N | Ladybird | 50 | 8 | 15 | | | | 125 | 14 | 25 | 22 |
| Lussier | SMAR_050003 | N | | 40 | 75 | 180 | 20 | | 100 | 120 | 494 | 200 | 45 |
| Matthew | SMAR04000011 | N | | 42 | 8 | 6 | 20 | | 20 | 100 | 115 | 50 | 9 |
| Gold/Joseph | CB25 | N | Gold | 10 | 5 | 14 | | | | | 29 | 19 | 4 |
| | | N | Joseph | 3 | 10 | 11 | | | | | 18 | 37 | 4 |
| Caribou | LARL_04000003 | N | Rodd, etc | 5 | 5 | 10 | | | | | | | |
| | | N | Walton, etc | | | 7 | | | | | | 10 | 2 |
| | | N | Upper Caribou | | | | | | | | | | |
| | | N | Lower Caribou | 2 | 2 | 2 | 10 | | | | | | |
| | | N | Londonderry | | | 4 | | | | | | | |
| | | N | Goat canyon | | | | 3 | | | | | | |
| Kuskanax | UARL_0400016 | N | Gardner | 7 | 7 | 6 | | | | | | | |
| | | N | Raven | | | 2 | 5 | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bayonne/Upper Priest | KL_32 | N | Lower residual | | | 2 | 20 | | | | | | |
| | | N | Benton | | | 2 | 10 | | | | | | 2 |
| | | N | Upper residual | | | 2 | 5 | | | 40 | | | 2 |
| | | N | Upper Kuskanax | | | | | | | | | | |
| | | N | Friedenberger | | | 2 | 2 | | | | | | |
| | | N | Bayonne | | 5 | 5 | 30 | | | | | 3 | |
| | | N | Boundary/Upper Priest | | | | | 15 | 5 | | | 7 | |

## Table 3. Minimum Data Requirements for Watershed Units

### 3a) All Watershed Units

| MoF District | Watershed Unit # | Watershed Unit Name | Regional priority for domestic water supply (VH, H, M) | Regional priority for fish (VH, H, M) | Key watershed for region (Y/N) | (Categories I-V) Likelihood of Success | MYA # (for Ws units with active projects) | Name(s) of implementing partners | Transition Watershed (Y/N) |
|---|---|---|---|---|---|---|---|---|---|
| Arrow | SLOC_O5000002 | Wilson/Bremner | M | H | Y | H | 200 | | N |
| Arrow | LARL_O4000003 | Caribou Cr. | VH | VH | Y | H | 200 | | N |
| Arrow | UARL_0400016 | Kuskanex Cr. | VH | VH | Y | H | 200 | | N |
| Arrow | AR_28 | Ladybird | VH | H | Y | H | 212/205 | | N |
| Arrow | DUNC_03000022 | Wilkie Creek | VH | H | Y | H | 204 | | N |
| Arrow | UARL_04000018 | Mosquito Creek | M | VH | Y | H | 204 | | N |
| Arrow | AR_8 | Eagle | M | H | Y | H | 208 | | N |
| Columbia | UARL_050000004 | Akolkolex | M | H | Y | H | 215 | | N |
| Columbia | CLRH_05000002 | Esplande | M | H | Y | H | 207 | | N |
| Columbia | CLRH_05000002 | Sullivan | M | H | Y | H | 207 | | N |
| Columbia | REVL_040000019 | Jordan River | M | H | Y | H | 214 | | N |
| Columbia | RV_25 | No Name | M | H | Y | H | 204 | | N |
| Kootenay L. | KL_32 | Upper Priest | VH | VH | Y | H | 210 | | N |
| Kootenay L. | KL_23 | Blewett | VH | H | Y | H | 212/205 | | N |
| Kootenay L. | KL_8 | Trout Lake | M | H | Y | H | 209 | | N |
| Kootenay L. | KL_15 | Coffee Creek | M | H | Y | H | 209 | | N |
| Kootenay L. | KL_31 | Duck Creek | H | M | Y | H | 213 | | N |
| Kootenay L. | KL_16 | Powder/Akokli Creek | H | M | Y | H | 213 | | N |
| Kootenay L. | KOTL_04000019 | Kitchener | VH | H | Y | H | 203 | | N |
| Invermere | IN_36 | White River | M | VH | Y | H | 201 | | N |
| Invermere | COLR05000002 | Forster/Francis | VH | M | Y | H | 201 | | N |
| Cranbrook | CB_25 | Joseph Creek | VH | VH | Y | H | 952 | | N |
| Cranbrook | SMAR_04000011 | Matthew Creek | VH | VH | Y | H | 203 | | N |
| Cranbrook | ELKR_05000005 | Bighorn | M | VH | Y | H | 203 | | N |
| Invermere | SMAR_05000003 | Lussier | M | VH | Y | H | 203 | | N |
| Boundary | BD_8 | Overton/Moody | H | M | Y | H | 211 | | N |
| Boundary | BD_5 | Tuzo | M | VH | Y | H | 211 | | N |
| Boundary | KETL_04000014* | Boundary | M | H | Y | H | 211 | | N |

## Table 3. Minimum Data Requirements for Watershed Units

### 3b) 3 year forecast of expenditures per Watershed Unit

For all WS Units with existing projects (may be expanded as per local preference)

| Watershed Unit | Watershed Number | Transition Watershed (Y/N) | Subbasins Within WU | Overview Assessment | | | Prescriptions | | | Major Works | | | Effectiveness Evaluation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Upslope | Riparian | In-Stream | Upslope | Riparian | In-Stream | Upslope | Riparian | In-Stream | |
| Gold/Bachelor | CLRH05000015 | N | Gold | 16 | 16 | 16 | | | | 200 | 40 | 20 | 12 |
| | | N | Bachelor | 16 | 30 | 30 | | | | 360 | 40 | 20 | 4 |
| Esplande | GD18 | N | | 15 | 5 | 5 | | | | 170 | 15 | 15 | 4 |
| Coffe Creek | KL 18 | N | Coffee | 15 | 5 | 5 | 8 | | | 20 | | | 25 |
| | | N | Woodbury | 25 | 5 | 10 | 10 | | | 20 | | | 10 |
| | | N | Lendrum | 13 | 5 | 5 | 8 | | | 35 | | | 20 |
| Trout Lake | KL8 | N | hamson, Benson, C | 90 | 10 | 10 | | | | 40 | | | 10 |
| | | N | Laughton, etc | 5 | | 5 | 10 | | | 25 | | | 2 |
| Wilson | SLOC05000002 | N | Wilson | 50 | 5 | 10 | | | 40 | | | | 5 |
| | | N | Harlow | 10 | | | | | | | | | |
| | | N | Fitzstubbs | | | 5 | 20 | | | | | | |
| | | N | Bremner | 5 | | 5 | | | | | | | 2 |
| | | N | Ranch | | | 5 | | | | 15 | | | 2 |
| | | N | Hamling | 5 | | | | | | | | | |
| | | N | Monitor | | | | 15 | | | | | | |
| Deer/Ladybird/Cayuse | AR-28 | N | Syringa | | | | | | | | | | 13 |
| | | N | Deer | | | 30 | | | | | | 25 | 10 |
| | | N | Cayuse | 5 | 5 | 60 | | | | 5 | | | 10 |
| | | N | Little Cayuse | 5 | 5 | 20 | | | | | | | 3 |
| | | N | Ladybird | 50 | 8 | 15 | | | | 125 | 14 | 25 | 22 |
| Lussier | SMAR_050003 | N | | 40 | 75 | 180 | 20 | | 100 | 120 | 494 | 200 | 45 |
| Matthew | SMAR04000011 | N | | 42 | 8 | 6 | 20 | | 20 | 100 | 115 | 50 | 9 |
| Gold/Joseph | CB25 | N | Gold | 10 | 5 | 14 | | | | | 29 | 19 | 4 |
| | | N | Joseph | 3 | 10 | 11 | | | | | 18 | 37 | 4 |
| Caribou | LARL_04000003 | N | Rodd, etc | 5 | 5 | 10 | | | | | | | |
| | | N | Walton, etc | | | 7 | | | | | | 10 | 2 |
| | | N | Upper Caribou | | | | | | | | | | |
| | | N | Lower Caribou | 2 | 2 | 2 | 10 | | | | | | |
| | | N | Londonderry | | | 4 | | | | | | | |
| | | N | Goat canyon | | | | 3 | | | | | | |
| Kuskanax | UARL_0400016 | N | Gardner | 7 | 7 | 6 | | | | | | | |
| | | N | Raven | | | 2 | 5 | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N | Lower residual | | | 2 | 20 | | | | | | |
| | | N | Benton | | | 2 | 10 | | | | | | 2 |
| | | N | Upper residual | | | 2 | 5 | | | 40 | | | 2 |
| | | N | Upper Kuskanax | | | | | | | | | | |
| | | N | Friedenberger | | | 2 | 2 | | | | | | |
| Bayonne/Upper Priest | KL_32 | N | Bayonne | | 5 | 5 | 30 | | | | | 3 | |
| | | N | Boundary/Upper Priest | | | | | 15 | 5 | | | 7 | |

# Appendix 5 a) 1999 SSFM PROJECT RANKING TIERS

## Part 1 – MoF Ranking

The following projects have been proposed by Ministry of Forests staff on the basis of reviewing TSR documents, workplans associated with the KBLUP-IS and in consultation with industry. The numbering scheme is not intended to reflect any priorization.

### Tier 1

Tier 1 projects are considered to have high significance (positive and/or negative) to both timber and environmental values.

| Project Number | Project Name | Description of Project |
|---|---|---|
| LUP/MoF-1 | Data Library | For all resource inventory projects:<br>• Identify standards and format for digital data entry. Ensure consistency in data entry for corporate and non-standard/localized data.<br>• Develop format and maintain meta data.<br>• Creation and maintenance of a website for data storage and update.<br>• Ensure access for appropriate users. |
| LUP/MoF-2 | Data Processing | Process resource inventory data into ***"resultant data base"*** required for analytical tools. |
| TSR/MOF-12 | ECAs for watersheds | GIS project to map and determine ECAs for watersheds will allow them to be modelled better in TSR and provide more realistic harvest schedules. (Continuation/enhancement of project currently underway by Larry Price) |
| TSR/MOF-13 | OGMAs | Inventory potential OGMAs, (which will also require some updating of forest cover inventories in National Parks, particularly in Golden, Revelstoke and Invermere TSAs). |
| TSR/MoF-15 | Spacial explicit/ adjacency analysis | Continue with spacially explicit analysis consistent with recommendation in Golden AAC rationale and Spatial Timber Supply Modeling Project recommendations (linkage with BCE-42) |

## Tier 2

Tier 2 projects are considered to have high significance (positive and/or negative) to timber values, and moderate or neutral values for the environment.

| Project Number | Project Name | Description of Project |
|---|---|---|
| TSR/MOF-1 | VRI Phase 2 Sampling | VRI Phase 2 ground sampling to apply unbiased adjustments to the newly completed VRI Phase 1 classification of the Golden TSA. All methodology established to RIC standards. The MOF has the staff and expertise to deliver under their current mandate. |
| TSR/MOF-2 | VRI Phase I | Year 3 of 3 - Golden TSA VRI |
| TSR/MOF-4 | PSP Measurements | Remeasurements of permanent sample plots. All standards and methodology in place.<br>Randomly established therefore captured mixed stands and partial cuts as well. |
| TSR/MOF-8 A | Operability issues | Evaluate / update - current operability line<br>(Priority areas only) |
| TSR/MOF-10 | Non-recoverable losses | Update the estimated losses due to NRLs/OAF 2 and armillaria root rots. Pilot project proposed for Kootenay Lake Forest District. |
| LUP/MoF-8 | Planning Tools Implementation and Operational review | Obtain operational feedback on (PCRS) planning tools implementation and develop:<br>- new reports<br>- enhancements |

## Tier 3

Tier 3 projects are considered to have moderate significance (positive and/or negative) to timber values, and moderate or neutral values for the environment.

| Project Number | Project Name | Description of Project |
|---|---|---|
| LUP/MoF-3 | Planning/ Analytical Tools linkages project | Pilot project proposed for Kootenay Lake Forest District to demonstrate linkages of planning hierarchy and identification of appropriate analytical tools.<br>- generate computer harv. systems blocking for district<br>- load FSSIM/SIMFOR data sets for strategic analysis<br>- load ATLAS/SIMFOR data sets for selected LU's<br>- link stand level envir. Accounts model in West Arm Demo Forest to Atlas<br>- run strategic and tactical level analysis, interpret outputs and write report. |
| LUP/MoF-4 | Visual Landscape Inventory | Methodology in place<br>" Field proofing required<br>" Linked to TRIM |
| LUP/MoF-5 | AOA Upgrades | Biophysical assessment of suitability over the last 10,000yrs. Computer assisted model (Eagle Vision) has been piloted in St. Mary's LU. |
| LUP/MoF-6 | AOA Upgrades | Biophysical assessment of suitability over the last 10,000yrs. Computer assisted model (Eagle Vision) has been piloted in St. Mary's LU. |
| TSR/MOF-5 | PSP Measurements | Ecological Classification of backlog established PSP's. All standards and methodology in place. |
| TSR/MOF-6 | PSP Measurements | Establishment of new permanent sample plots. All standards and methodology in place, and efficient delivery by MOF staff. |
| TSR/MOF-7 | Volume and Decay | Completion of sampling of ICH/ESSF Spruce and Balsam for decay verification for possible adjustment for TSR 3. |
| TSR/MOF-8 B | Operability issues | Terrain stability mapping to evaluate / update ESAs (priority areas only) |
| TSR/MOF-8 C | Operability issues | Evaluate / update - Low site / low "quality" stands including hi elev./CwHw and dec/conifer mix Stands/PFT |
| TSR/MOF-9 | Wildlife tree patches | Developing landscape unit objectives and methodology for measuring compliance. |
| TSR/MoF-11 | Non-recoverable losses | OAF 1 study to localize factors used in adjusting G&Y functions for irregular stocking |

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|---|---|---|
| TSR/MoF-14 | Partial Harvest Inventory | Ensure post harvest inventory labels are correct and reflect residual stand stocking |
| TSR/MoF-16 | SIBEC Sampling | Site index correlation to Biogeoclimatic Ecosystem Classification |
| TSR/MOF-17 | SIBEC Sampling | Site index assignments to forest inventory polygons needs to be completed. Providing BEC based estimates of site index and using the TEM base. |
| TSR/MoF-18 | Growth and Yield strategic plan | Develop a strategic G&Y plan for each management unit |
| TSR/MoF-19 | OGSI Validation | Establish field based plots in regenerated stands to see if the increases in site productivity suggested by old growth site index studies are fully warranted. Should follow G&Y strategic plan (MoF-18) |
| TSR/MOF-3 | VRI Phase I | Completion of TFL 3 VRI (not recommended for funding) |
| TSR/MoF-20 | Forest Dynamics | Determine the dynamics in non contributing stands regarding contributions towards biodiversity and old sereal account. Compare past and present inventories and review inoperable areas for catastrophic pest and fire events. Equates to TSR/BCE - 1 |
| TSR/MoF-22 | Riparian Accounting | Provide better methodology to determine riparian habitat using existing inventories and stream classification. |
| LUP/MoF-7 | Biodiversity Monitoring plan | Develop Biodiversity Monitoring Plan as part of development plan and LU planning process. Linkage with BCE - 42 |
| IAMC - 15 ACCESS | Data base - road densities | 29.3 A database will be maintained for all roads to enable the calculation of existing and future road densities. Ministry of Forests will conduct a pilot project in the Invermere Forest District. |

The following table contains a listing of projects that are currently underway and expecting to require funding in fiscal 2000/01 to continue and/or complete. Funding needs may be the result of non completion of an annual project and/or a multiyear project/contract.

| Project Number | Project Name | Description of Project |
|---|---|---|
| MOF-1 | VRI – Phase 1 | Complete new Vegetation Inventory – Phase 1 (classification) of the Golden TSA. 1999/00 is Year 2 of a multi-year (3) contract. |
| MOF-2 | VRI – Phase 2 (101975) | Phase 2 random sampling of a subpopulation on TFL 8 to adjust the inventory population if significant. |
| MOF-5 | Site Index Adjustment (101839) | Random field sampling to compare ground site index to inventory site index in immature stands using VRI sampling methodology. Old Growth Site Index |
| MOF-6 | SIBEC Sampling (10163) | Site Index correlation to Biogeoclimatic Ecosystem Classification |
| MOF-7 | GY Strategic Plan (712009) | Development of a Growth and Yield strategic plan for TFL 3. |
| MOF-9 | TSM (712536) | P&T TFL 23 TSM |
| MoF-10 | Forest Health Inventory (712538) | P&T TFL 23 Forest Health Overview Flights (FIDS type) |
| MOF-11 | TSM (10167) | ATCO TSM |
| MOF-12 | TSM (18897) | Kalesnikoff TSM |
| MOF-13 | TSM (712536) | TSM Level D Updates for TFL 23 |
| MoF-14 | Forest Health (10014) | Forest Health Annual Aerial Overview on TFL 14 |
| MoF-15 | TEM (10015) | TEM (as per RIC standards) was completed in May 1999. The balance of the project is broken into a number of phases which utilize the TEM data as the "coarse filter" to id information gaps (eg: habitat suitability/capability for id'd species) |
| IAMC - 5 | FMER | Continue FMER planning program in Cranbrook and Boundary. Cranbrook is in the process of "stratifying" Range Units into Ecosystem Management Units as per the NDT4 Ecosystem Restoration Guidelines of the KBLUP-IS. Includes stratifying the Ecosystem Management Units into tentative treatment units with treatment recommendations. Boundary is moving in this direction but are in the process of assessing the application of the NDT4 algorithm for the NDT4 ecosystems in the Boundary Forest District. Project details to be worked out. |
| IAMC - 7 | ERDZ-T | Develop and apply enhanced mapping or theming techniques to identify the best location for intensive industrial forestry activity. The intent is to increase volumes of merchantable |

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|---|---|---|
| | | timber, to streamline the permitting process and provide associated employment benefits, while maintaining basic environmental quality. Include inventory check of domestic watershed boundaries and use - concentrating on watersheds in low and intermediate BEO. ERDZ-T project addresses a proactive socio-economic strategy to identify economic opportunities for intensive timber activity. Produce those statistics and map products necessary to resolve the location and the draft ERDZ-Ts and describe the management systems to be used within their boundaries. Main focus will be to describe the location and extent of "relatively unconstrained Timber Harvesting Landbase (THLB)" assuming different strategies of management. Need to await outcome of Wouters Prov. Policy review. |
| IAMC - 10 | Recreation planning and access management | Details yet to be finalized. Proposing a recreation planning compatibility matrix to assist in commercial recreation referrals. Also proposing inventory work for recreational uses and mining. May include road identification, use and density. Will involve NGO consultation to identify uses or activities. |
| IAMC - 14 | Park Boundary Clean-up | MOF District Offices have indicated discrepancies in Park Boundaries given different data sources. Risk is therefore being incurred with Forest development planning operations with risk of trespass into Protected areas. Assemble all digital data for Protected areas. (LUCO, MOF, MOE, Parks, National and Provincial). Assemble all Meta data associated with source data. Plot data in map format at defined scale . Summarize differences in data sources. |

## PART 2 – MELP Ranking

Projects Significant to Environmental Value –
Tier 1: Highest Priority

| **Number** | Name | **Description** |
|---|---|---|
| TSR/BCE-2 | Assessing the ecological appropriateness of the percentages in table 20 and the maximum interpatch distance for stand level biodiversity. provided in the Biodiversity Guidebook / Determining actual percentages reserved as WTP's i.e. current practice. | Building on previous work completed in 1998 the ecologi appropriateness of table 20 and maximum interpatch dista outlined in the BGB will be assessed. This will be accom by reviewing available information from the Nelson Fore: and other jurisdictions with similar ecosystems. |
| TSR/BCE-1 | Stochastic Disturbance on the Non-Contributing Landbase | Reviewing existing data from a variety of sources, includi collected in protected areas to estimate occurrence of stan initiating disturbance in areas which would be considered contributing |
| TSR/BCE-4 | Evaluating the effect of Seral stage distribution on amount and timing of | An evaluation of existing data and interpretations from va jurisdictions to determine what if any watershed thresholc |

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|---|---|---|
| | peak flow in watersheds with respect to fish habitat | levels are needed to ensure that associated increases in pe as well as changes in timing of peak flow do not harmfull fish habitat. |
| LUP/BCE-65 | Hydrometric monitoring | Operation of hydrometric station on Lost Horse Creek. |
| LUP/BCE-1 | Aquatic Conservation Strategy | A regional aquatic conservation strategy will be develope guide decisions on the protection, conservation, restoratio monitoring of aquatic ecosystems incorporating Goal 2 of in the West Kootenay, and the implementation of the FPC strategy will incorporate the concepts of integrated waters planning and management. |
| LUP/BCE-11 | Bull trout telemetry - Kootenay River between Bull River and Canal Flats (St. Mary, Bull, White, Findlay, Lussier and Skookumchuck) | Identify critical spawning habitats for protection and enhancement. |
| LUP/BCE-35 | Old Growth Structural Attributes Assessment | Identification and classification of old growth structural a by biogeo subzone variant to be used in L.U planning and recruitment. |
| LUP/BCE-18 | Bull trout and rainbow telemetry - Slocan Lake | Tracking into tributaries to find spawning locations and d habitat importance accordingly. Establish priorities for b trout/rainbow habitat protection |
| LUP/BCE-19 | Umatilla Dace (R), Mottled Sculpin (B) and Shorthead Sculpin (B) Inventory - Kootenay, Columbia, Slocan River and Tribs. | Inventory |
| LUP/BCE-20 | Reconnaissance Stream Inventory (year two) - | Reconnaissance Fish Inventory |
| LUP/BCE-13 | Bull trout telemetry - Kootenay Lake | Tracking into tributaries to find spawning locations and d habitat importance accordingly. Establish priorities for b habitat protection. |
| LUP/BCE-10 | Burbot telemetry - Duncan system | Find spawning location. Lower reaches of tributaries exp Fishery for Kootenay Lake population has collapsed and i closed. Intensive studies and rehabilitation efforts are pre underway. Duncan system likely to be key to restoration. |
| LUP/BCE-58 | R&B Fish Species Inventory | 1:20,000 Fish and Fish Habitat Inventory |
| LUP/BCE-12 | Skookumchuck Fence - Skookumchuck Creek | Operate a fence and trap to determine size of bull trout sp run and identify critical spawning areas. |
| LUP/BCE-15 | Cutthroat telemetry - Elk River between Elko and Elkford | Identify critical spawning habitats for protection and enha (many areas are being logged). |
| LUP/BCE-16 | Rainbow telemetry - Salmo River | Find spawning location. No existing data. |
| LUP/BCE-56 | Grizzly Bear Habitat Mapping | Identification of Grizzly Bear Habitat through use of exist information |
| LUP/BCE-17 | Cutthroat telemetry - St Mary River | Identify critical spawning habitats for protection and enhancement. |
| LUP/BCE-8 | Sturgeon Study - Kootenay Lake | Tagging and tracking sturgeon |
| LUP/BCE-9 | Sturgeon Study - Columbia | Tagging and tracking sturgeon |
| LUP/BCE-36 | Caribou Population/Habitat Study | Caribou Population and habitat assessment in the Golden district |
| LUP/BCE-37 | Ungulate Winter Range Analysis | Ungulate winter range classification, use identification an |

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| | | population inventory |
| LUP/BCE-3 | Regional Water Quality Objectives Setting (H) | Water quality and water quantity monitoring is ongoing ir strategically-selected watersheds which have been chosen maximize efficiency in data collection in the highest prior areas. Data collected will be used to set water quality ob a requirement under the Forest Practices Code. A statistic significant data set requires 3-5 years of water quality and quantity data. This data will also be used to assess the sta health of the Region's aquatic ecosystems as well as their temporal and spatial variability. Data collected will also l to calibrate and refine the watershed assessment procedur Kootenay region. |
| LUP/BCE-46 | Rare and Endangered species/habitat assessments/recon surveys | Tailed Frog (R; IDW); Coeur d'Alene Salamander (R); N Leopard Frog (R; nf); Western Screech-owl, marfarlanei (R); Williamson's Sapsucker, nataliae spp. (R); Least Ch selkirki spp. (R; nf); Badger (R): esp. 'southern sub-pop' (Cranbrook FD); Northern Long-eared Myotis (B); Lewi: Woodpecker (B; IDW); Red-tailed Chipmunk, ruficaudu: (R); Least Chipmunk, oreocetes ssp. (R; nf); Red-tailed Chipmunk, simulans ssp. (R); Northern Pocket Gopher, se ssp. (R; nf); Western Grebe (R; IDW; nf in Koot); Uplanc Sandpiper (R); Forester's Tern (R; nf); Yellow-breasted C IDW); Grasshopper Sparrow (R; IDW); Am. White Pelica IDW; nf in Koot.); Swainson's Hawk (R); Reconnaissanc Biodiversity Monitoring: Reconnaissance for Biodiversity Monitoring; Grassland Reconnaissance Surveys for Gras: Sparrow, Peregrine Falcon, Prairie Falcon, Yellow-breast Long-billed Curlew, Lewis's Woodpecker, Bobolink, Shar Grouse, Badger (or ground squirrel colonies as an index). Cliff Reconnaissance Surveys for Peregrine Falcon, Prairi Falcon, White-throated Swift, Canyon Wren; "Montane" Plant Species Reconnaissance Surveys for:a) Sweet-mar: butterweed ( Senecio foetidus, vars. foetidus and hydroph (both vars. R), b) Easter Daisy (Townsendia exscapa) (F Hookers townsendia (Townsendia hookeri) (R); "Range' Reconnaissance Plant Surveys for a) Scarlet Gaura (Gau coccinea) (R), b) Flat-topped Broomrape (Orobanche corymbosa, spp. mutabilis) (R), c) Blue Gamma (Boutel gracilis) (R) |
| LUP/BCE-38 | Ungulate winter range methods standardization | To develop a standard methodology to identify, classify a UWR's regionally |
| TSR/BCE-3 | Assessing Representiveness at Variant vs Site Series (surrogate) | Using a number of selected Landscape Units, OGMA's w deployed at the variant level and also at the site series sur level (using the proportionate rule). An assessment will t conducted to determine the risk to biodiversity if certain such as plant or animal species/communities are not adequ represented at the variant level. In addition a timber supp impact analysis will be conducted. |
| LUP/BCE-44 | Combined spp.habitat assessment | Combined species habitat assessment projects designed tc |

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| | project | evaluate habitat requirements and management strategies integrated, multi-species objectives within L.U's. |
| LUP/BCE-14 | Bull trout telemetry (3rd year) - Upper Arrow Lake | Tracking into tributaries to find spawning locations and d habitat importance accordingly. Establish priorities for b habitat protection. |
| LUP/BCE-62 | Stream temperature monitoring | Install and operate continuous stream temperature monito selected Kettle River tributaries. Stream temperature mon uses well-established environmental monitoring technolo Methodology will be identical to existing on-going projec southern Okanagan, Merritt and Lytton areas. |
| LUP/BCE-66 | Water quality monitoring Sutherland | Water quality monitoring on Sutherland Creek. |
| LUP/BCE-67 | Water quality monitoring Moody | Water quality monitoring on Moody Creek |
| LUP/BCE-7 | Domestic Watershed Intake Mapping | Industry and MOF attempts to find and map intakes and c water users are often made difficult or impossible by poor information available from MELP water licenses. This p would apply a systematic approach to gather better infor directly from water licensees. |
| LUP/BCE-71 | Stream Inventory - 1:20,000 Reconnaissance | Inventory and modelling to improve RMA estimates |
| LUP/IAMC-A4 | Access management and recreation planning | |
| LUP/IAMC-A3 | Inventory and classification of decisuous leading stands for biodiversity | |
| LUP/IAMC-A1 | Fire maintained ecosystem restoration | |

## Summary Table 2B:
## Projects Significant to Environmental Value –
## Tier 2: High Priority

| **Number** | **Name** | **Description** |
|---|---|---|
| LUP/BCE-2 | Air Quality Management Strategy | An *Air Quality Management Strategy* would address the management of airsheds in this Region to ensure air quali maintained within national and provincial criteria. Airsh the issues within them must be clearly identified along wi strategy towards the development of air quality managem plans. |
| LUP/BCE-21 | Reconnaissance Stream Inventory | Reconnaissance Fish Inventory |
| LUP/BCE-24 | Bull trout telemetry (2nd year) - Salmo River | Tracking to find spawning locations and determine habita importance accordingly. Establish priorities for bull trout protection. |
| LUP/BCE-26 | Bull trout telemetry - Lake Revelstoke | Tracking into tributaries to find spawning locations and d habitat importance accordingly. Establish priorities for b habitat protection. |
| LUP/BCE-25 | Bull trout telemetry - Lower Arrow lake | Tracking into tributaries to find spawning locations and d habitat importance accordingly. Establish priorities for b |

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|---|---|---|
| | | habitat protection. |
| LUP/BCE-22 | Bull trout redd location and numbers - Duncan system | Identify redds. Numbers and specific location by flying ar walking. |
| LUP/BCE-23 | Bull trout redd counts - Wigwam and Skookumchuck | Continue to monitor bull trout redds |
| LUP/BCE-27 | Evaluate juvenile rearing habitat of Gerrard rainbow - Lardeau river | Evaluate juvenile rearing habitat in tributary streams |
| LUP/BCE-42 | Environmental Supply Review - HSI/SIMFOR analyses | To develop 5 HSI's to be used in SIMFOR modelling for planning - intention is to develop one additional ungulate coupled with HSI's for Interior dependent species. |
| LUP/BCE-40 | Grizzly Bear Habitat Studies | Grizzly Bear habitat analyses - scale dependent - Multi-L |
| LUP/BCE-55 | Ungulate Monitoring Program | Monitoring program to evaluate health of ungulate herds. |
| LUP/BCE-43 | Grizzly Bear Population Studies | GB population inventory in recovery areas |
| LUP/BCE-68 | Deer Winter Range | Updating current deer winter range mapping incorporatin methodologies |
| LUP/BCE-61 | Climate monitoring | Install climate monitoring station at existing Lost Horse C hydrometric station. Will be installed and operated by W Survey Canada to AES standards. |
| LUP/BCE-5 | Domestic Watershed Mapping Attributes | MELP created digital mapping of domestic watersheds fo KBLUP-IS. At that time resources were not available to c an attribute database for the mapping which would allow directly access information about the watershed such as w licensing information. This addition would greatly enhan efficiency and utility of the mapping and would allow ties databases. |
| LUP/BCE-50 | R&E - Goshawk Inventory/Mapping | Application of Goshawk HSI and field Inventory of Gosh nests regionally |
| LUP/BCE-53 | Access Mgmt/Grizzly Bear | To evaluate Access Management issues/options within Gr Bear habitat and develop tools to aid in management |
| LUP/BCE-39 | Predictive Ecosystem Mapping | Cost effective methodology to evaluate ecosystem represe below the variant level for OSP id, LU planning, and oper planning for specific env. values. |
| LUP/BCE-6 | Small Stream Inventory Project | One of the greatest problems in applying domestic waters guidelines of KBLUP-IS, is the absence of accurate mapp many small streams. This project would manage a contra provide field survey and mapping for streams in selected where mapping does not exist. |
| LUP/IAMC-A2 | Biodiversity in protected areas versus non-protected areas to monitor ecosystem health | |
| LUP/IAMC-A6 | ECA seral stage literature search | |
| LUP/IAMC-A7 | Alluvial and debris torrent fan inventory - phase 2 | |
| LUP/BCE-49 | Rare and Endangered Ecosystem Inventory | Inventory of Black Cottonwood ecosystems and identifica ecological value |
| LUP/BCE-4 | Regional Water Quality Objectives Setting (M) | Same as above for watersheds of medium priority areas; are not ongoing |
| LUP/BCE-69 | Biodiversity Project | Biodiversity modelling project for forest planning |

## Summary Table 2C:
## Projects Significant to Environmental Value –
## Tier 3: Moderate Priority

| Number | Name | Description |
|---|---|---|
| LUP/BCE-41 | Grizzly Bear Habitat Studies | Avalanche track/vaccinium classification, mapping and in |
| LUP/BCE-32 | Mottled Sculpin inventory - Flathead river | Fish inventory |
| LUP/BCE-33 | Bull trout, rainbow, cutthroat and kokanee redd study | Digitize redd locations. Identify redd locations for habitat protection. |
| LUP/BCE-34 | Fish inventory web page development | Improve web page so fisheries data can be viewed or dow from site. |
| LUP/BCE-45 | Caribou Habitat assessment - central Selkirks | To model caribou use in the central Selkirk study area usi different habitat management scenarios (lumping L.U's v keeping them separate for habitat retention) |
| LUP/BCE-30 | Kootenay River & Upper Columbia Kokanee study | Continue to monitor kokanee spawning numbers. |
| LUP/BCE-31 | Reconnaissance Lake Survey | Fish Inventory |
| LUP/BCE-70 | Lake Inventory - 1:20,000 Reconnaissance | Primary and secondary lakes component of 1:20,000 fish habitat inventory |
| LUP/BCE-29 | Largemouth Bass reconnaissance lake survey - Duck Lake near Creston | Reconnaissance Lake Survey |
| LUP/BCE-63 | Hydrometric monitoring | Install hydrometric/climate monitoring station on Upper Creek. Will be installed and operated by Water Survey national standards for hydrometric monitoring and AES s for climate monitoring. |
| LUP/BCE-64 | Hydrometric monitoring | Install hydrometric/climate monitoring station on Sandne Will be installed and operated by Water Survey Canada t national standards for hydrometric monitoring and AES for climate monitoring. |
| LUP/BCE-47 | Terrestrial Ecosystem Mapping | Site series mapping in L.U's for LU planning |
| LUP/BCE-57 | Goshawk Inventory | Identification of Goshawk nest and habitat areas |
| LUP/BCE-48 | Caribou lichen regeneration | Develop regeneration methods for Bryoria lichen in carib habitats meeting the structural/environmental requirement reserve areas but lacking the requisite age (8/9). |
| LUP/BCE-51 | Access inventory and Monitoring/Impact analyses | To identify, classify and map existing roads within Cranb and to develop a monitoring strategy with respect to ident risks to ecological values resulting from their use. |
| LUP/BCE-28 | Rainbow telemetry - Trout Lake | Tracking into tributaries to find spawning locations and d habitat importance accordingly. Establish priorities for ra habitat protection |
| LUP/BCE-52 | Deciduous forest conversion to evergreen fibre production impact analyses | Examine impacts to ecological values as a result of decid forest conversion to conifer stands. |

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| LUP/BCE-54 | Caribou Population/Habitat Studies: Monitoring | Monitoring program to evaluate the health of the region's populations on a periodic basis |
| LUP/BCE-59 | PEM | Expand existing ecosystem mapping to remainder of distr RIC PEM methodology |
| LUP/BCE-60 | Medium Carnivore Inventory | Development of interpretations for medium carnivores ba existing habitat mapping |

# APPENDIX I: Kootenay/Boundary SSFM Regional Planning Team

| | |
|---|---|
| Don Bouzane | Forest Renewal BC |
| Bernie Peschke | Ministry of Forest |
| Kathy Eichenberger | Ministry of Environment, Lands & Parks |
| Mike Geisler | Ministry of Forest |
| Chris Hollstedt | Southern Interior Forest Extension Research Program |
| Peter Affleck | Interior Lumber Manufactures Association |
| Margaret Bakelaar | Kootenay/Boundary Inter-Agency Management Committee |
| Jane Miller/Paul Jeakins | Arrow Forest District Innovative Forest Practices Agreement |
| John Beerbower | Environmental Community |
| Lloyd Havens | Crestbrook Forest Industries |
| Alex Ferguson | Slocan Forest Products |
| Matt Besko | Ministry of Environment, Lands & Parks |
| John Pollack | Ministry of Forest |
| Dennis Hamilton (facilitator) | Nanuq Consulting |

# APPENDIX II: Ministry of Forests SSFM Tiered Priorities (1999)

(Bernie P. to insert)

# APPENDIX III: Ministry of Environment, Lands and Parks SSFM Tiered Priorities (1999)

(Kathy E. to insert)

# APPENDIX 5 b): SSFM Issues Summary Reports

## HIGH PRIORITY REGIONAL SSFM ISSUES

Spatial Analysis

Landscape Unit Planning – Old and Mature Forests

Structural Attribute Definition of Old and Mature Forests

Mountain caribou

Ungulate Winter Range

Maintenance of Water Quality, Quantity and Timing of Flows

## MEDIUM PRIORITY SSFM REGIONAL ISSUES

Maintenance of Sufficient Old and Mature Forest Within the Landscape

Site Series and Predictive Ecosystem Mapping

Fisheries

TSR – Unstable Terrain

TSR – Partial Cutting

Grizzly Bear

## LOW PRIORITY SSFM REGIONAL ISSUES

TSR – Operability Limits

TSR – Operational Adjustment Factors (OAFs)

## SSFM Issue: Spatial Analysis

**Background:**

Analytical experiences with the implementation of FPC guidelines and the KBLUP-IS suggest a systematic, spatial approach to forest estate analysis is required for all management units in the Nelson Forest Region (NFR).

This project would allow government to accurately test the effects of a higher level plan on wood supply, and industry to identify and find that supply on the ground.

This is a critical issue for the licensees within the Nelson Forest Region and may be linked with a number of Forest Renewals investment strategies within SSFM.

The risks associated with not resolving this issue are high as uncertainties related to higher level plan implications on wood supply and its sustainability will continue.

**Knowledge Needs/Gaps**

- Create a common and unified database for all NFR management units (which currently does not exist) upon which accurate spatial analyses can be conducted.
- Aspatial analysis is currently used in TSR, therefore there is a need for development/benchmarking of spatial forest estate models for all NFR management units.
- The proposed approach, with general recommendations, has been developed by an experienced GIS/wood supply analysis team consisting of MoF Branch and Regional staff and industry

**Product/Objective**

- Produce standardized, accessible database, based upon standardized rules for netdowns, for the application of KBLUP and other guidelines and spatial modelling.
- Development of spatial forest estate models for all NFR management units. Spatial version of existing aspatial models (ie: FSSIM, FORUM, CASH/FM) may be considered viable alternatives.

**Activities**

- a technical team comprised of Research Branch, Timber Supply Branch, regional specialists and industry reps., will complete the development of a detailed work plan, and the selection of the first two management units for analysis.
- A common, unified database in ARCINFO is strongly recommended. The additional costs for preparing a common database will be recouped during the analysis phase of the project. Modelling results will be more comparable amongst management units, and there would be a database legacy for quick response to government requests for further analysis.

- A standard approach to netting down landbase, and apply HLP rules, is recommended.
- Assessment of historical and current spatial planning initiatives to assess databases and interpretation of earlier results.
- "Benchmarking" studies of the various spatial models will be required to confirm each model's functionality. This step ensures different models deal with resource constraints and requirements in the same way.
- A set of key economic indicators would be included as standard analysis outputs.

**Cost Estimates**

- Estimated costs are based on the Merritt IFPA experience, which cost approximately $95,000 for the one management unit.
- In total, the project would be approximately $1 million with the first year being in the $350k range.

**Implementation Strategy**

- Piloting approach to test database preparation, benchmarking and modelling initially in 2 management units before using technique globally, although a similar project was undertaken in the Merritt IFPA
- A central use of such analyses is more precise evaluation of the wood supply implications related to the higher level plan and to the selection of policy alternatives.
- Additionally, the creation of a systematic and spatial approach would facilitate testing different management and policy scenarios for non-timber values and environmental accounts

**Performance Indicators**

- Having project analyses and evaluations factored into new government management options and decisions.

This project should lead to TSR3 being spatially based.

## SSFM Issue: LUP - Old Growth and Mature Forest

### Background

There is a need to evaluate candidate old growth and mature forests, within the Nelson Forest Region, to ensure that the most ecologically appropriate forests are identified. This evaluation will require an inventory and ranking of potential stands under the imminent Higher Level Plan. Current deadlines for establishment of old stands and wildlife tree patches is June 2002.

If this inventory and ranking of old and mature forests is not conducted then there will be a foreclosing of options (e.g. increased fragmentation) and the possibility of some high value old and mature forests being harvested.

### Knowledge Needs/Gaps

- There is the need to confirm or revise existing forest cover inventory to ensure that old and mature stands are correctly identified prior to any selection being made.
- There is the need to incorporate an objective ranking system that reflects, besides age, a stands' structural attributes. This project will aid in evaluations of biological quality of candidate old growth reserves to be located and designated by June 30, 2002.

### Product/Objective

- By addressing this issue, the implementation of the strategic plan (Higher Level Plan) for the Kootenay Boundary will be initiated. In turn, this will assist in timber supply reviews by having a more definitive description of current management.

### Activities

- Each District would have an office and field (aerial) training session.
- Operational field work would be emphasizing aerial flights whereby whole landscape units would be assessed for candidate old and mature stands.
- An overall spreadsheet would be produced outlining all the candidate stands with a recommended ranking.

### Cost Estimates

- Based on experienced costs of $3,000 per landscape unit, the total project cost would be approximately $250,000. This factors in that of the 192 landscape units within the Nelson Forest Region some are at various stages of completeness.
- Landscape unit cost breakdown is as follows:

| | |
|---|---|
| GIS/data support | $1,000 |
| Flight costs | $1,500 |
| Report writing | $ 500 |
| Total | $3,000 |

### Implementation Strategy

- Ministry staff are ready to implement this initiative immediately. Partnerships with MELP and industry would result in fully understanding the dynamics of landscape unit planning in the context of old growth and mature forest establishment.

**Performance Indicators**

- The end result would be a ranking of all candidate old and mature stands within a landscape unit such that decision makers could select the most appropriate stands for establishment by June 2002.

## SSFM Issue: Structural Attribute Definitions of Old and Mature Forests

**Background:**

Structural attributes of old and mature forests provide the habitat elements that government is striving to maintain through the setting of seral stage targets.

Stands of a given age class, can exhibit a wide variation in structure, and in addition, forest cover mapping is not always reliable. Defining old-growth or mature forest without assessment of structure may therefore fail to identify the most biologically important areas of forest.

Work in three BEC units in the Nelson Forest Region has provided definitions and field assessment tools that allow relative ranking of 'old-growthness'. This aids in evaluation of biological quality of candidate old growth reserves. Methods could be extended to indexing mature attributes as well.

Attribute definition of old forest in NDT4 in the Nelson Forest Region has relied on studies in this type of fire regime in the United States. There is some disagreement as to the applicability of this research to areas in Canada.

The risk of not resolving this issue would be incorrect identification and delineation of old and mature forests as required by government by July 30, 2002.

**Knowledge Needs/Gaps:**

- Definitions of these seral stages at present are based on age.
- The BEC units sampled to date include widespread ICH variants from the dry to moist (south central) portion of that zone in the region, one ESSF unit from the southern Purcells, and this year the MSdk, a large mid-elevation subzone in the East Kootenay will be completed.
- Although desirable to have definitions for all BEC units, work in 5 additional units should give coverage to the majority of the land area and will largely cover the climatic variability of the Nelson Forest Region. This is for units amenable to the methodology for the previous work (all NDTs except 4).

**Product/Objective:**

- Index of old-growthness projects in ESSFdk, ESSFwc4 (two largest remaining variants), ICHwk1 (large variant significantly wetter than previously sampled ICH), MSdm1 (important variant in Boundary District) and ICHvk (Revelstoke).
- Stand reconstruction and fire history studies in the IDFdm1.

**Activities:**

- Produce standard methodology (Std. Operating Procedure) or RIC method.
- BEC unit sampling based upon methodology from the previous works completed.

- Stand reconstruction and fire history studies in the IDFdm1

**Cost Estimates:**

- Estimated cost of $50,000/variant for a total of $250,000
- Stand reconstruction and fire history study (~$50,000)

**Implementation Strategy:**

- Locally derived structural attribute definitions for old-growth and local data on disturbance regimes would aid in ecosystem restoration prescriptions and landscape allocation of structural attribute objectives.

**Performance Indicators:**

## SSFM Issues: Mountain Caribou

**Background**

Mountain Caribou are a species of provincial management concern. They are a red-listed species and require special management consideration to maintain healthy, sustainable populations and sufficient amounts of suitable/capable habitat upon which they depend. Five sub-populations exist regionally: Revelstoke, Central Selkirk, Southern Selkirk, South Purcell, and Central Rockies. The South Selkirk and South Purcell sub-populations are in imminent danger of extirpation and require recovery.

Caribou are largely lichen dependent and resource conflicts have arisen with respect to forest harvesting of arboreal lichen supporting mature and old forests. Commercial recreation demands or other factors such as incidental predation may also be adversely impacting present caribou populations. Information is required to refine/confirm existing knowledge regarding habitat suitability and capability relative to seasonal use patterns, the distribution of mapped caribou habitat on a given landscape, and the amount of suitable and capable habitat required for mountain caribou given their distribution on that landscape. Such information gaps need to be addressed and planning tools need to be developed to mitigate resource conflicts, both spatially and temporally.

The biological, social and economic risk of not resolving these issues is high. Some caribou sub-populations may become extirpated. Significant declines in caribou numbers may occur in other sub-populations. In comparison to other caribou sub-populations, the Central Selkirks and Revelstoke caribou are ranked as having the highest economic cost of conservation in the province.

Mountain Caribou management is a legislated component of the regional Higher Level Plan. Objectives specify that a percentage of suitable old forest be retained on the operable portion of mapped caribou habitat by BEC within a given landscape unit. It is critical to know what suitable and capable habitat is, where it is currently located on the landscape, and where recruitment should occur over time to maintain habitat supply on a stable, sustainable basis. This information is also required to develop mitigation strategies with respect to forest development activities. Mountain caribou management is also a component of the corporate policy generated from the Kootenay/Boundary Land Use Plan Implementation Strategy, both in terms of resource management objectives and associated guidelines. Additionally, it is a significant net-down component in TSR processes regionally.

**Knowledge Needs/Gaps**

- Existing status of knowledge/information related to Mountain caribou include:
- telemetry and satellite location/habitat association information is available for Revelstoke, South Purcell, and South Selkirk sub-populations.
- Limited telemetry information is available on other sub-populations
- Habitat Suitability Indices (HSIs) are available for all sub-populations except the Central Rockies

- Currently used and mapped habitats are being refined for the South Purcell and Central Selkirk sub-populations using a consensus-based committee drawing on telemetry, expert driven qualitative analyses, and habitat use studies including HSI.
- Guideline objectives exist that require given amounts of suitable mature and old forest be retained by BEC within landscape units mapped as caribou habitat.
- Limited stand level guidelines are available for partial cutting opportunities.
- Some modelling in Atlas-SIMFOR has been initiated for Central Selkirk and a portion of South Purcell sub-populations.

Inadequacies/inefficiencies of existing knowledge/information include:

- Telemetry studies need to be finished for Central Selkirks, South Selkirks and South Purcell sub-populations
- Stand level habitat attribute information on baseline data is lacking
- Existing baseline data (forest cover) is often inaccurate for purposes of mapping habitat capability/suitability
- Current caribou Habitat Suitability Index models are based on broad forest cover baseline data and are not sufficiently tested
- Attribute functions such as lichen abundance and dispersal are not tested
- No augmentation or recovery plans are developed for sub-populations at risk of local extirpation.
- Guidelines are applied to caribou in general, are a-spatial and are not ecosystem specific relative to the specific habitat use patterns and habitat requirements of specific sub-populations
- Populations and habitats are not being monitored extensively
- The effects of perturbation are not assessed
- research and habitat simulation modelling using ATLAS/SIMFOR is not extensive on sub-populations

**Products/Objectives**

- Refined/confirmed mapped caribou habitats by sub-population
- Refined/confirmed guideline sets
- Recovery strategy for sub-populations at risk of extirpation
- Monitoring strategy and adaptive management process
- Guidelines for attribute based modelling and analyses
- Model outputs of HSI's in ATLAS/SIMFOR
- Continued Population and habitat monitoring
- Perturbation effects mitigation process established

**Activities/Strategies**

- refine or confirm mapping using capability/suitability methods, telemetry and modelling
- inventory and monitor populations
- assess options with respect to population recovery; implement recovery
- revise/confirm management guidelines
- analysis of perturbation effects

**Costs**

- capability/suitability mapping, telemetry and modelling ($80,000)
- inventory and monitor populations ($160,000)
- population recovery and implementation ($75,000)
- management guidelines ($15,000)
- perturbation effects ($60,000)

**Implementation Strategy**

- Mapped caribou habitats will be refined/confirmed and available for HLP revision in 3 years
- Guidelines will be refined/confirmed as above

**Performance Indicators**

Outline the specific targets and performance indicators for evaluation of success relative to the issue and knowledge/information activities and strategies identified to address the issue

## SSFM Issue: Ungulate Winter Range

### Background

Ungulate winter range throughout the Kootenay/Boundary region must be identified, mapped and classified using ecologically sound criteria in order to meet the year 2003 legislative requirement of the Forest Practices Code. The current broad ungulate winter range mapping needs to be evaluated and refined to meet strategic and operational planning needs of the Forest Practices Code, regional land use plan and timber supply reviews. Guidelines that address forest cover retention requirements must also be evaluated, refined and/or confirmed in this context. A regional ungulate winter range committee must be established to resolve mapping and guideline issues.

If deficiencies in ungulate winter range mapping and management guidelines are not addressed then year 2003 statutory requirements will not be met and ungulate habitats may become at risk. Further, the regional land use plan direction may not be effectively implemented, Forest Development Plans may remain in contention, Landscape Unit planning and objective setting may be difficult to develop or implement, and Timber Supply Review netdowns may not accurately reflect management practices. Inconsistent applications of guidelines may be also be problematic.

### Knowledge Needs/Gaps

Existing status of knowledge/information related to the ungulate winter range issue includes:

- Canada Land inventory mapping (1:250,000) for ungulates was completed for the region in 1970
- Kootenay/Boundary Land Use Plan –Implementation Strategy winter ranges were refined in October of 1998 at a scale of 1:50 000 using biogeoclimatic mapping, expert driven qualitative analysis, capability indices
- habitat use and telemetry studies have been completed on select watersheds only in the West Kootenays (eg. Lardeau, Pend'Oreille, Hoder Ck/ Little Slocan lakes). Extensive winter count and telemetry information is available in the East Kootenays.
- Habitat Suitability Index (HSI) models based on forest cover mapping have been developed for Elk and Mule Deer
- Ungulate habitat ratings standards are available to conduct ungulate winter range habitat capability/suitability mapping (Demarchi et al)
- Baseline Terrestrial Ecosystem Mapping/Predictive Ecosystem Mapping is available for winter ranges in the Invermere and Arrow forest districts.
- Regional land use plan guidelines that identify amounts of mature and old forest cover to be retained on ungulate winter ranges are provided for each ungulate species by BEC distribution units

Inadequacies/inefficiencies of existing knowledge/information for ungulate winter ranges includes:

- Invermere forest district ungulate winter ranges are mapped at 1:250,000 and are considered coarse
- no habitat mapping exists for Mountain goat and winter ranges are not currently managed
- existing ungulate winter range guidelines are controversial with respect to amount of mature/old forest cover required to be retained within landscape units.
- Ungulate winter ranges as refined in the land use plan need to be reviewed as their are still some anomalies with respect to extensions of winter ranges in some areas which do not correspond with known ungulate winter use.
- Existing forest cover classification data used to delineate ungulate forest retention requirements is inaccurate with respect to forest planning
- Ungulate winter forage is not addressed under existing strategic direction or guidelines
- A regional committee is required to coordinate ungulate winter range mapping and guideline requirements
- guidelines need to be evaluated, refined or confirmed according to habitat requirements
- populations need to be inventoried and assessed
- habitats and populations need to be monitored to assess guideline effectiveness

**Products/Objectives**

- ungulate winter range capability/suitability habitat maps and habitat supply models for each forest district
- refined guidelines based on improved knowledge on distribution, ecosystem function and habitat attribute requirements
- adaptive management /monitoring

**Activities/Strategies**

- a regional ungulate winter range committee needs to be established – perhaps two committees to deal with wet belt and dry belt forest ecosystems occupied by ungulates
- ungulate baseline inventory, research, habitat analysis and habitat mapping needs to be completed
- habitat use patterns need to be better understood for modeling habitat supply over time
- existing guidelines need to be evaluated, refined or confirmed based on an improved inventory, habitat attribute data and ecological relationships and processes
- monitoring and adaptive management based on results

**Costs**

- to be broken down by task

**Implementation Strategy**

- Regional committee guides ungulate winter range project priorities and proposed inventory and mapping standards

- guideline implementation and habitats are monitored to assess guideline effectiveness
- guidelines are modified accordingly based on adaptive management
- Regional committee evaluates ungulate winter range products, analyses and mapping products and recommends guidelines to be declared by statutory decision makers

**Performance Indicators**

- Meeting statutory requirements for mapping of ungulate winter ranges
- habitat supply is sustainable and meets ungulate winter range objectives
- reduced conflict regarding implementation of ungulate winter range mapping and guidelines

## SSFM Issue: Maintaining Water Quality, Quantity and Timing of Flow in Community and Domestic Watersheds

**Background:**

Many water users believe that logging in their watershed will ruin the quality of their water supply and therefore they oppose any forest development in their watershed. At the same time, other aquatic values may also be at risk, such as red and blue listed fish species, amphibians, and aquatic plants which contribute to the biodiversity of our region. Conversely, the forest industry believes that the Forest Practices Code offers sufficient protection of the water resource and is frustrated by the hurdles that they encounter in carrying out any activity within these watersheds.

The Kootenay Boundary Land Use Plan provides direction to ensure that water quality, quantity and timing of flow will not be negatively impacted by forest development. The Higher Level Plan offers increased protection of riparian areas within domestic watersheds. The Forest Practices Code requires industry to meet water quality objectives (WQO) where they exist. BC's Auditor General has released a report sounding the alarm for the protection of consumptive water and made recommendations on action to be taken in watersheds where forest development is occurring. To compound this problem, there is insufficient information to properly assess the physical, chemical, bacteriological and biological impacts of forest harvesting on water quality and flow and to assess the long-term forest management impacts on aquatic resources.

FRBC has funded a number of water quality and stream flow monitoring stations in community and domestic watersheds; however the collection of baseline data is only one component in determining whether water values are being maintained in logged watersheds.

### *Water Quality Objectives*

**Knowledge Needs**

- Through Forest Renewal funding the region has up to 4 years baseline data in select community watersheds. So far this information has not been linked back to the forest management activities taking place in the monitored watersheds. Need to use this information to develop and test the use of water quality objectives as a tool to measure sustainability of forest management practices on water resources.

**Objectives**

- To verify the appropriateness using Water Quality Objectives (as per FPC)

**Activities**

- We propose to develop water quality objectives for 4 watersheds through statistical analysis of existing data. Continue monitoring the 4 watersheds to test the use of those objectives.

**Estimated Cost**

- $80,000

**Implementation Strategy**

- The information gathered will be used to determine the effectiveness of Water Quality Objectives. If it is found to be a useful tool it can be implemented in other Community Watersheds. If it is found to be less than useful, it can be modified, or the research used to revisit the application of WQO's in the Forest Practice Code.

**Performance Indicators**

- Validation or refinement of WQO's as an effective management tool to measure forest management impacts on the water resource.

### *Continued Water Quality and Quantity Monitoring*

**Knowledge Needs**

- Ongoing Water Quality and Quantity monitoring will assist in determining regional variability and developing baseline data. Have just begun monitoring in some watersheds in 1998 and 1999 – need three years minimum of data to set water quality objectives and do regional summary.

**Products/Objectives**

- To set measurable targets for the determination of drinking water quality. Water quality will be an essential component of international certification.

**Activities/Strategies**

- We propose to continue monitoring in select watersheds to obtain sufficient data for statistically valid analysis, and to allow for setting of future WQO's.

**Estimated Cost**

- $330,000 regionally (including the Boundary District)

**Implementation Strategy**

- Information gathered will be used for setting future WQO, and determining regional baseline water quality data to be used in planning exercises

**Performance Indicators**

- Provide more certainty for forest managers and statutory decision makers in ensuring water quality is protected. Address criticisms that relate to forest development in the Attorney General's report on the quality of drinking water.

### *Regional Data Analysis*

**Knowledge Needs**

- We need to understand the natural variability in water quality and flow regimes in the Kootenays, and apply this in land use decisions. To date we have collected 2-4years of data on 40 streams. This data needs to be summarized, and Gis analysis done to correlate the information to existing information (BEC zones, soil types, terrain mapping, IWAP/ CAP, ECA, etc.

**Products/Objectives**

- To develop a land planning tool for assessing impacts of forest harvesting on the Water Resource.

**Activities/Strategies**

- Analyze collected regional water quality and stream flow data collected to date to create, in consultation with industry and MoF, land planning tool to relate water quality information to existing forestry planning tools.

**Estimated Cost**

- $100,000 for data analysis/links to GIS

**Implementation Strategy**

- Depending on results we may find links to certain soil types, BEC variants, terrain stability, IWAP/CAP, and ECA to Water Quality parameters. This information can be applied to future forest management decisions.

**Performance Indicators**

- Provide more certainty for forest managers and statutory decision makers in ensuring water quality is protected. Addresses criticisms that relate to forest development in the Attorney General's report on the quality of drinking water

### *Community Partnerships/Community Involvement*

**Knowledge Needs/Gaps**

- Water users are asking the Ministry to monitor their watersheds where there is forest management planned. With no Ministry resources available, and a change in strategic objectives for Forest Renewal funding, monitoring will become the responsibility of the communities that use the water resource.

**Products/Objectives**

- Develop regional tool kit for use by lay-samplers and community water user groups.

**Activities/Strategies**

- Creation of water sampling tool-kit for effective, low cost water and channel monitoring during construction and long term development. Create information package regarding water quality monitoring and it's limitations. Public open house and training opportunities for lay samplers.

**Estimated Cost**

- Develop tool kit for water users $ 40K

**Implementation Strategy**

- This information will give the water user some understanding in water quality, and the ability of the water purveyor to monitor their own water and watershed.

**Performance Indicators**

- Creation of partnerships between forest licensees and the water user in protecting the water resource.

### *Rapid Bioassessment Procedures.*

**Knowledge Needs/Gaps**

- Currently many of the water quality impact assessment tools commonly used take several months if not years to carry out and require a fair amount of resources to undertake. In addition, water chemistry alone cannot directly be used to define the ecological consequences of small incremental changes in water quality and quantity as a result of a land use activity in a watershed. US EPA has developed benthic Rapid Bioassessment Procedure (RBP) that have proven to both quick and cost effective.

**Products/Objectives**

- Benthic invertebrate data that has been collected in this region under the FRBC Water Resources Inventory Program, must be summarized and a monitoring program developed consistent with the US EPA protocols, to calibrate the RBP for use in this region. In other words, a regional benthic invertebrate monitoring program would be conducted to characterize species tolerances relevant to this area. This data will then form the basis for assessing impairment of streams using the RBP.

**Activities/Strategies**

- Prepare a contract to carry out the regional benthic invertebrate monitoring programs in select watersheds throughout the region using US EPA protocols for RBP.

**Estimated Cost**

- $30K

**Implementation Strategy**

- Once the program is completed and a report prepared this information will be used by MELP, the forest industry and/or water user groups to implement the Rapid Bioassessment Procedure in watersheds of concern.

**Performance Indicators**

- The RBP will allow land use managers to identify those watersheds that are impaired as a result of land use activities, identify the sources and causes of that impairment, and evaluate the effectiveness of control actions or rehabilitation.

## SSFM Issue: Maintaining Sufficient Old and Mature Forests Within the Landscape

**Background:**
Old growth management areas (OGMAs), permanent reserves of old forest, are to be located on the ground and designated by June 30, 2002 according to government policy. Direction for designating OGMAs is provided in the Landscape Unit Planning Guide (LUPG) and the Kootenay – Boundary Land Use Plan, portions of which will be designated a Higher Level Plan (HLP) in the next few months. The HLP also sets out levels of mature forest to be maintained within landscape units These policy directives seek to integrate the achievement of numerous management objectives, such as maintaining old and mature forests, caribou and grizzly bear populations, visual quality, water quality, and timber supply.

There are three sub-issues under maintaining mature and old forests addressed herein.

- It is unclear how the rules designed to meet these objectives interact when applied on the ground.
- Targets for old and mature are deployed by biogeoclimatic variant within landscape units. Present biogeoclimatic mapping was not designed for application to modelling and analysis at scales used for landscape unit planning
- As well, the target levels for old and mature forests are controversial and are based in large measure on expert opinion. These targets have significant impacts on environmental and economic values.

Objectives may not be optimised through the use of these allocation rules and certain values may suffer while causing economic impacts.

Significant inaccuracies in applying biogeoclimatic mapping at landscape unit scales have been revealed by projects to improve the accuracy of the mapping in Arrow and Columbia Districts. OGMAs located according to the present mapping may be improperly classified and not representative of the variant mapped.

If estimates of natural levels of old and mature are inaccurate this may have a significant environmental and economic impact.

A better sense of impacts and possible refinement of the rules can be obtained by modelling the possible consequences of applying the rule sets to a number of landscape units.

Biogeoclimatic mapping is being increasing used in forest management modelling. It is vital that mapping of an appropriate scale is used for the results of this modelling to be accurate.

The principle that management should reflect patterns of natural disturbance has been adopted through the biodiversity guide book. The establishment of natural ranges of variability in disturbance interval and hence amounts of old and mature forests in the landscape is central to the governments conservation strategy. These figures should be based as far as possible on empirical evidence.

**Knowledge Needs/Gaps**

- Environmental and economic impacts of different approaches to meeting the suite of objectives laid out in the HLP.
- Mapping accurate to 1:50 000 scale for the remainder of the Forest Region.
- Ranges of natural variability of seral stage distributions for major BEC units and/or ecoregions of the forest region

**Products/Objectives**

- Report and maps detailing results of modelling in several Landscape Units
- Digital mapping and plot files for Districts completed.
- Literature review of work from comparable environments and proposal for further work given landscape condition and available data.

**Activities/Strategies**

- Modelling of pattern of OGMAs resulting from application of HLP rules and evaluation in terms of timber impact, HLP objectives, and old growth values.
- Large scale (1:50 000) subzone mapping in Kootenay Lake, Cranbrook, Invermere, and Boundary (in order of priority).
- Investigate methods for establishing natural range of variability of area of old forest by Biogeoclimatic Ecosystem Classification.

**Costs**

- $50 000 to produce report and maps for modelling in several LUs
- $25 000/ District in house; $40 000/ district by contract to complete digital mapping and plot files for districts completed.
- $30 000 for literature review and proposal for further work.

**Implementation Strategy**

- Request for proposals
- Methodology established, timeframe dependant on availability of regional ecologist and/or contractors.

## SSFM Issue: Site Series and Predictive Ecosystem Mapping (PEM)

### Background

Site series mapping has widespread applications including wildlife habitat modelling, site index adjustment, and silvicultural planning. Site index adjustment can have dramatic effects upon growth and yield estimates and hence timber supply. As forest management becomes increasingly sophisticated, the need for ecosystem mapping at scales appropriate to landscape unit planning (i.e. 1:20 000, 1:50 000 scale) becomes greater.

The development of Predictive Ecosystem Mapping (PEM), an automated means of producing these maps, has significantly reduced the cost of these maps. Site series mapping has primarily been done or is proceeding, either in response to Ministry of Environment, Lands, and Parks desire to produce wildlife capability maps or TFL holders' desire to obtain site index adjustments.

It would be very desirable to have region-wide mapping to enhance landscape unit planning and improve timber supply analysis.

### Knowledge Needs/Gaps

- The existing ecosystem mapping that is available within the region can serve as model calibration areas that may allow surrounding areas to mapped more readily. The existing mapping can serve as nodes from which the remaining mapping can spread.
- An integral part of site series mapping is obtaining localised large scale BEC subzone/variant mapping. This mapping is available for Arrow, Columbia, and a portion of Invermere Forest Districts. Having this mapping available for the rest of region will greatly reduce cost and increase accuracy of the subsequent PEM.
- PEM and/or TEM is progressing in most TFL's.

### Product/Objective

- Large scale BEC subzone mapping for Kootenay Lake, Cranbrook, remainder of Invermere, and Boundary Forest Districts.
- PEM completed for Nelson Forest Region.

### Activities

- Large scale BEC subzone mapping for Kootenay Lake, Cranbrook, remainder of Invermere, and Boundary Forest Districts
- PEM for Columbia District (large scale BEC exists, ecosystem maps for Wood River, Cummins River, and Kirbyville Creek exist) including TFL 55/56.
- PEM for Invermere District (large scale BEC exists for about ½ of District), ecosystem maps exist for TFL14, Steamboat Mtn., Brewer Cr., Premier-Diorite, Stoddart Creek)

- PEM for Boundary, Kootenay Lake, Cranbrook

**Cost Estimates**

- Large scale BEC subzone mapping ~$60,000 based upon $25,000/district in house (~$40,000/district by contract)
- PEM total for the region ~$612,000 based upon $.15/ha x THLB and $.10/ha x NC.

**Implementation Strategy**

- Site series and PEM are key to Ungulate Winter Range identification and mapping, as required in FPC by 2003.
- Improved large scale BEC subzone mapping will increase accuracy of PEM and enhance Land Use Planning in general.

**Performance Indicators**

- Complete large scale BEC subzone mapping in 2001/02 and PEM by 2003/04.

## SSFM Issue: Fisheries

**Background**

Many issues still surround SSFM (Strengthening Sustainable Forest Management), KBLUP (Kootenay Boundary Land Use Plan) and TSR (Timber Supply Review). SSFM needs to increase the capacity of the BC sector to meet some of the challenges of certification (CSA, FSC) and meet its main business areas. Many questions in KBLUP from identifying endangered aquatic species to help to protect and conserve aquatic ecosystems still have to be addressed. Increasing the confidence of the Timber Supply estimates is always a goal trying to be achieved. Maintaining bull trout (blue listed, international significance) habitat and protection requires better knowledge to remove uncertainties surrounding forest development activities. Many of these issues can be addressed through fisheries inventories; however, many areas of the Kootenay region still lack basic fisheries data, population status and critical habitat locations.

**Knowledge Needs/Gaps**

- Presently, the Kootenays lacks basic fisheries inventory data for approximately half of the region. Many of these areas will be impacted by resource development. In addition, our knowledge in species specific habitat (e.g. bull trout spawning areas) is limited as few populations have been studied. Conducting inventory in these data gaps will provide information about fish distribution, status and about supporting habitats. Thus, resolving many resource development issues.

**Products/Objectives**

- Reconnaissance level inventories provide biophysical maps and data for entire watersheds, focusing on fish species characteristics, distributions and relative abundance as well as stream reach and whole lake biophysical data for interpretation of habitat sensitivity and capability for fish production. Use of the FHAT20 interpretive model along with the reconnaissance level inventory will be a key element for forest planning as predictions of fish distribution and channel characteristics (e.g. channel width), thus stream classifications can be made. Strategic level use for the FHAT model would result in increasing the confidence of the Timber Supply estimates. Accurate predictions of width and fish presence can be used to refine volumes of timber in Riparian Management Areas. The model gives a summary of the length of stream in each stream class, as well as the total area covered by Riparian Reserve and Management Zones based on those classes. If Forest Inventory maps are overlain with this information, an accurate picture of the volume of timber in each of these categories will emerge. The model estimates channel widths and can give some indication of the likelihood a mapped channel is not present in the field (the Reconnaissance No-Visible Channel, NVC). This information can help licencees refine cost estimates for many types of fieldwork (e.g., inventories, road layout) that may vary based on the number of streams present in or near a cutblock. In future, we hope to improve this procedure to predict such things as channel type that could identify the stability of the channel and it's response to potential disturbance. Intensive inventories generate additional information needed for the designation and management of specific fish populations and habitats at risk. These inventories will be used in establishing Identified Wildlife Areas.

**Activities/Strategies**

- To address the above-mentioned issues Reconnaissance level inventories in combination with FHAT20 modeling will be conducted to address TSR, KBLUP and SSFM issues. Intensive inventory studies would commence for key species that have the potential to be impacted by resource development using techniques such as telemetry and fish fences. The intensive inventory will be able to provide more detailed info for KBLUP and SSFM issues and will aid in developing Identified Wildlife Areas.

**Estimated Cost**

- The cost of Reconnaissance inventory along with modeling will cost approximately $600,00-650,000 in year 2001 and be reduced to $3-400,000 by the third year and down to $100,000 by the 5 year. At this time the majority of watersheds that will be impacted by resource development will be completed. The information obtained from the Reconnaissance inventory will identify certain fish stocks that will require more intensive inventory (e.g. location of bull trout spawning and overwintering). Consequently, intensive inventories will increase in cost as Reconnaissance inventory decreases. It is predicted that the cost of intensive inventory for 2001 to be $50,000 and increase to $250,000 by the third year and remain at that level until the 5-year when the projects will wind down by the 7th year. The cost benefit will be seen in more accurate numbers regarding the TSR, refining cost estimates for many types of fieldwork and even provide crucial data such as bridge or culvert. Other benefits will be in providing protection to fish habitat and specific high profile stocks. This of course is difficult, if not impossible to put a dollar figure on.

**Implementation Strategy**

- Fisheries inventory data is crucial for resource development and proper management of the watershed. Inventory will increase the confidence of the Timber Supply estimates by providing riparian classifications and modeled. Answers to KBLUP questions and issues will be addressed such as "Protect and Conserve aquatic ecosystems", "Protect, conserve, and reduce risks to rare, threatened and endangered terrestrial and aquatic species" and finally "Ensure the sustainability of fish species diversity and populations, especially wild fish stocks". The SSFM objective of "conserve biological diversity" will be answered regarding fisheries and will aid in the Certification System. Inventories will increase the capacity of the BC sector to meet some of the challenges of certification (CSA, FSC) and help SSFM to meet its main business areas. Inventory will identify environmental sensitive areas and provide more precise Riparian Reserve Zones for streams, lakes and wetlands. Fisheries Inventory will also play a key role in establishing Identified Wildlife Areas for bull trout. In addition, inventory data will allow fisheries managers to identify where improvement in stocks can be achieved and may even help in setting fishery limits and regulations.

**Performance Indicators**

- The specific target of the inventory program will be to have fisheries data for all the watersheds for the Kootenay Region and detailed life history information for key populations. In providing comprehensive fisheries data conflicts regarding fisheries should be limited. Each fishery related question raised that can not be answered would indicate performance targets not met and change the direction of the program.

## SSFM Issue: TSR Inputs for Unstable Terrain

**Background**

- During past Timber Supply Reviews (TSR), netdowns for unstable terrain and avalanche hazards has been identified as either a high priority issue or an information need by the Chief Forester (due to the associated large degree of uncertainty) when making the Annual Allowable Cut (AAC) determinations.
- There is currently a desire to use the extensive terrain stability mapping (TSM) carried out to calculate netdowns for the TSR process. The belief is that it will provide a more accurate estimate of land with terrain stability constraints than does the tradition ESA mapping which is being phased out of the inventory.
- The risk, if not undertaken, is the continued uncertainty as to the completeness and accuracy of the terrain stability inventory.

**Knowledge Needs/Gaps**

- Comparing unstable terrain shown on TSM with E1s and E2s shown on the forest cover data base for the Cranbrook TSR, Peter Jordan found that:
  - TSM gave a more reliable indication of terrain stability constraints than ESA mapping, and
  - TSM resulted in a lower netdown than that calculated from ESA mapping.
- TSR review process includes a netdown for snow avalanche hazard (Ea), however, the Ea designation is rarely used and when mapped is unreliable.
- Terrain mapping files are available, however, they need to be retrieved, translated and corrected due to their existence in a variety of conditions and formats.
- Need standardized data and methodology for incorporating operability concerns over slope stability and erosion into the next TSR.

**Product/Objective**

- Develop standard methodology for determining more accurate netdowns based upon terrain stability mapping.
- Provide a more reliable indication of terrain stability constraint locations and realistic impact for incorporation into upcoming TSR processes.

**Activities**

- Conduct research to develop a method for reconnaissance level avalanche hazard mapping and a suitable netdown procedure.
- Repeat analysis conducted for the Cranbrook TSR in time for other management unit (MU) TSRs. Involves collection of proponent files, corrections and translation into common format and the analysis and comparison with forest cover ESA classifications.

**Cost Estimates**

- Approximately $10-30,000/MU to carry out GIS works, air photo interpretation and analysis of results between TSM and forest cover mapping.
- Approximately $1-2/Ha to develop stand alone GIS method for adding avalanche hazard interpretation. Total cost may total $100-200,000 based upon 10 mapsheet estimate.

**Implementation Strategy**

- TSM/forest cover analysis requires professional terrain mapper and GIS operator. If done in house with ministry staff/co op students costs may be at the bottom of the range noted above or about ½ of those expected by contracting out.

**Performance Indicators**

- TSM used to calculate netdowns for the upcoming TSR3 processes.

## SSFM Issue: Partial Cutting and TSR

**Background**

- Partial cutting has been conducted to various degrees throughout the Nelson Forest Region. The use of partial cutting is increasing in order to meet an increasing amount of management objectives. However, partial cutting is not well understood with respect to: 1) its ability to influence wood flow at the forest estate level (i.e.: Timber Supply Review); 2) growth and yield of the residual stand; 3) potential to meet specific management objectives (e.g.: biodiversity requirements, ungulate winter range, etc.). With the introduction of the Forest Practices Code and Land Use Plans, additional management objectives (e.g.: riparian areas, visuals, biodiversity, etc.) have resulted in an increased emphasis on partial cutting.
- Partial cutting is currently not modelled directly in TSR determinations but is rather addressed through sensitivity analyses of various factors or by lessening constraints.
- The risk associated with not resolving this issue is that there will be continued uncertainty about the true contributions of partial cutting to short and long term wood flow in TSR.

**Knowledge Needs/Gaps**

- Only one stand level model (PROGNOSIS$^{BC}$) is available that adequately models partial cutting practices.
- Partial cutting growth curves have not been developed for various combinations of species, site and management objectives. Consequently partial cutting growth curves cannot and are not used in TSRs.
- Partial cutting is not currently modelled directly in the Forest Service FSSIM wood supply model and consequently in ANY TSRs. In addition, FSSIM is not spacially explicit, resulting in low resolution outputs of partial cutting impacts.
- Except for two reports completed in the Nelson Forest Region in 1999, the strategic use of partial cutting versus clearcutting at the landscape and estate level has not been explored. Timber supply implications of partial cutting versus clearcutting are therefore not well known or understood.
- Previous studies have shown that partial cutting can relieve short and mid term wood supply shortages, but it does not show where potential partial cutting stands exist. This identification of potential stands is a critical step in linking high level estate planning to actual operational plans and practices.
- The key questions that need to be answered are: 1) what are the long-term implications of taking some volume now and harvesting stands with less volume in the future as a result; and 2) where and how much partial cutting should be done to relieve short term wood supply falldowns.

**Product/Objective**

- Develop a action plan to prioritize partial cutting issues that require address.

- Development and improvement of current PROGNOSIS$^{BC}$ and FSSIM models to allow impacts of partial cutting at both the stand and forest estate levels to be incorporated into TSR 3.

**Activities**

- Establish steering and sub-committees to develop the partial cutting action plans for the identified issues (ie: PROGNOSIS G&Y needs and model functionality).
- Develop detailed project plans incorporating all the necessary components to bring each issue to necessary resolve in a timely fashion (ie: research, analyses and extension)

**Cost Estimates**

- The steering committee and action plan development can be funded from within current operating budgets. The cost for each project component will be identified in the detailed project plans and will vary with the type of project.

**Implementation Strategy**

- Approved partial cutting modelling for use in TSR determinations will greatly enhance our confidence in sustainable timber supply forecasting. Further clarity and benefits would be realized if the modelling were based upon a spatially explicit database.

**Performance Indicators**

- Action plan that identifies partial cutting issues and priorities, with related research needs identified, by fall 2000.
- Partial cutting modelling incorporated into TSR 3 determinations.

## SSFM Issue: Grizzly Bear

### Background

Grizzly Bears are currently blue listed in BC and are in decline in many areas of the province and a provincial grizzly bear conservation strategy has been developed (i.e., grizzly bear recovery areas). Grizzly bears are impacted regionally by forest and mining developments, habitat loss and fragmentation, localized mortality, access proliferation, silviculture activities that truncate early seral successional stages and displacement due to anthropogenic activities. Maintenance of important forage associated with avalanche tracks is considered in the Higher Level Plan conservation objectives for grizzly bear and through Forest Practices Code riparian reserve and management zones. Forested buffers must be also be applied to all avalanche tracks within mapped priority grizzly bear areas, regardless of their habitat suitability. However, other important foraging habitats such as 'berry patches' and palatable vegetation complexes associated with fire and other disturbances are not currently managed. Access management is generally lacking throughout the region.

These current risks to the ecological stability of grizzly bear populations and their associated habitats are considered high if Higher Level Plan obligations are not fulfilled, and Timber Supply Review related net-downs for grizzly bears are not accurately measured and accounted for. Information gaps on habitat and populations may lead to uncertainty in forest development planning and precautionary measures to conserve habitats may affect economic objectives.

### Knowledge Needs/Gaps

Existing grizzly bear population and habitat management includes:

- Kootenay/Boundary Land Use Plan Implementation Strategy mapping of Grizzly bear priority habitats by ecosection
- Higher Level Plan objectives and guidelines to maintain forest cover around avalanche tracks
- DNA population inventory and habitat based analyses has been initiated/completed for Central Selkirks, Revelstoke and Flathead areas - as well as some other management units in the East Kootenays
- HSI currently being developed for the Flathead Landscape Unit planning process
- Avalanche track mapping methodology using aerial photographs has been designed for the region
- Assessment of avalanche track remote sensing analyses has been completed by Columbia Basin Fish and Wildlife Compensation Program (Ramcharita 2000)
- Avalanche track mapping pilot projects have been completed for some Landscape Units in Golden, Cranbrook and Invermere forest districts, as well as a few drainages in West Kootenays.
- *Vaccinium spp.* ecology study underway in Revelstoke
- Proposed Granby/Kettle Critical Grizzly Bear habitat mapping initiated

- Proposed Grizzly bear recovery areas are pending approval regionally

Inadequacies/inefficiencies of existing knowledge/information includes:

- Avalanche tracks are not extensively mapped and classified according to Higher Level Plan requirements
- forested buffers are not preferentially applied to avalanche tracks ranked important to grizzly bear use
- Access management for grizzly bears is not adequately addressed at the regional level
- Guidelines for management of grizzly bear habitats and populations are contentious between agencies and industry and need to be reviewed and refined/confirmed
- timing and duration of forest developments and the implications to seasonal grizzly bear habitat use has not been addressed regionally
- Population and habitat management strategies lack sufficient inventory information and scale dependent analyses
- Forage conservation management strategies are lacking
- Denning area management is not addressed

**Products/Objectives**

- regional grizzly bear inventory and habitat capability/suitability mapping (population distribution and abundance, mapping of avalanche tracks, riparian, feeding, denning areas, etc.)
- DNA studies
- regional access management planning
- habitat supply models
- implementation of provincial grizzly bear strategy

**Activities/Strategies**

- detailed avalanche track habitat mapping
- Access management planning
- Scale dependent habitat distribution maps and more accurate population estimates by landscape and management unit
- Forage supply models and guidelines
- Refined/confirmed habitat management guidelines
- Denning habitat area identification and evaluation
- Habitat supply models and outputs from ATLAS/Simfor

**Estimated Cost**

**Implementation Strategy**

- grizzly bear habitat mapping will support implementation of the regional land use plan and forest development and silviculture planning
- habitat supply modeling will assist with long term management of grizzly bears and accommodate timber supply review considerations for grizzly bear

**Performance Indicators**

## SSFM Issue: TSR Inputs for Operability Limits

### Background

- During the past Timber Supply Reviews (TSR) the issue of operability limits has been problematic and has consistently gained the attention of the Chief Forester when making the AAC determination in many Timber Supply Areas (TSA) and TFLs.
- Operability and inoperability are generally used to describe the presence or absence of physical barriers or limitation to harvesting, logging methods and the merchantability of stands. Physical and economic variables are highly variable across the region as are the resultant interpretations and mapping.
- Landbase reductions have one of the largest direct impacts on the sustainability of the timber supply. The risk of not addressing this issue is the continued uncertainty as to the actual timber harvesting land base upon which the AAC determination is based.

### Knowledge Needs/Gaps

- Operabilility lines and methodologies exist but in many cases are unreliable.
- Need to update operability lines, with the primary focus being areas of contention, based upon GIS and ground truthing.

### Product/Objective

- Updated operability lines to more accurately estimate the timber harvesting land base for modeling in TSR3.

### Activities

- Consult forest development plans, silviculture prescriptions and total chance plans in addition to air photo interpretation to update lines and target field checks.

### Cost Estimates

- Approx. $30,000 per management unit (TSA/TFL) to assemble data and plans, carry out a GIS analysis and field check the updated lines.

### Implementation Strategy

- This project allows for a high level of participation by licensees to ensure validation of operability lines prior to the next TSR.

### Performance Indicators

- Current and accurate operability line designations to be available for TSR3.

## SSFM Issue: TSR Inputs for Operational Adjustment Factors (OAF)

**Background**

- During past Timber Supply Reviews (TSR), operational adjustment factors (OAF) have been identified as problematic and have consistently gained the attention of the Chief when making the Annual Allowable Cut (AAC) determinations.
- The OAF's are applied to the yield curves of managed stands and of particular concern are OAF2 for addressing *Armillaria* root disease and other volume losses. *Armillaria* is present and a concern within all TSAs and TFLs.
- The risk, if not undertaken, is the continued uncertainty about the true impacts of *Armillaria* on the sustainability of the timber supply in the region.

**Knowledge Needs/Gaps**

- Historically OAF2s are used to account for decay, waste and breakage and are based on inventory data related to second growth forests.
- Impacts from insects and diseases require a larger reduction to be accounted for in the managed stand yield tables
- Root diseases, besides causing mortality singly and in patches (OAF1b) also causes growth losses throughout a rotation (OAF2).
- Volume and decay studies need to be established in immature stand types.

**Product/Objective**

- Establish volume and decay studies in immature stands to ascertain the reliability of the standard 5% OAF2 in time for TSR3
- Determine a methodology by which to obtain the magnitude of OAF2 attributable to *Armillaria* root disease

**Activities**

- Establish team of experts/steering committee (participants to include Forest Practices Br. and regional experts) to produce action plan. The result may confirm the need for the following activities.
- Design a sampling system based upon the size and variability of the targeted stand types.
- Established plots will have volumes measured and then have some trees destructively sampled(stem sectioning) to get a true measurement of decay and other losses.
- Recent developments have suggested Armillaria infected trees may be detected by the presence of resin rings thereby avoiding costly root excavations.

**Cost Estimates**

- Estimate approx. $100,000/district based upon establishment of 20-40 plots at roughly $3,000/plot ($1,000 establishment and $2,000 for destructive sampling)

- Contractor limitations would suggest 2 districts per year treated over 3 years for a total project cost of approx. $600,000

**Implementation Strategy**

- The sampling would be piloted in one district before it is fully implemented in the others to ensure that the number of samples is consistent with the variability being found in the plots. Plots would be established to the new Vegetation Resources Inventory (VRI) standard to ensure statistical validity

**Performance Indicators**

- OAF2 percentages utilized in TSR3 are based upon statistically valid immature stand decay and waste data.

# APPENDIX 5C
# STRENGTHENING SUSTAINABLE FOREST MANAGEMENT (SSFM)
### Request for Review of Draft Strategic SSFM Regional Issues

prepared by: **Kootenay/Boundary SSFM Regional Steering Committee**

## BACKGROUND

Forest Renewal B.C.'s (FRBC) five-year strategic plan for 1999-2004 is aimed at moving more towards sustainable forest management. Strengthening Sustainable Forest Management (SSFM) is one of seven strategic objectives that signifies a shift from operational level forest management to higher level strategic decision and planning processes around the Kootenay/Boundary Land Use Plan, Higher Level Plans and Timber Supply Reviews. This reflects a shift in FRBC investments to recognize a broader range of strategic activities – in comparison to previous years where the emphasis was primarily on operational level forest planning and management important for operational implementation of the Forest Practices Code.

The SSFM objective for FRBC is focused on two aspects of sustainable forest management: (1) maintenance of environmental values and (2) resource benefits (timber and non-timber). SSFM investments should provide forest resource managers with information about how management choices affect ecological processes and functions most at risk from strategic forest management decisions regionally and/or provincially. At the same time, support must be given to sustaining traditional industries such timber and non-traditional industries such as non-traditional forest products and ecotourism.[1]

In the above context, the Kootenay/Boundary SSFM Steering Committee is responsible for identifying and defining key sustainable forest management issues to be targeted by FRBC under the new SSFM objective. The steering committee has representation from the ministries of Forests and Environment, Lands & Parks as well as industry and the environmental community. The main tasks of the committee are:

- ☐ to identify the most critical strategic issues for sustainable development in the region;
- ☐ to develop a strategy for addressing each strategic issue with respect to strategic planning and management;
- ☐ to create a proposed action plan for each strategic issue including (a)identification of specific projects or activities, timelines, rationale and benefits, cost and, (b) identification of performance indicators to evaluate success;
- ☐ to collaborate with districts, stakeholders and environmental groups in finalizing the SSFM strategic issues and proposed strategies; and,

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[1] Husted, L. and C. Alexander. 2000. Resource Management Plan for Strengthening Sustainable Forest Management, Guidelines. Working Draft. Forest Renewal BC, Victoria, B.C.

## REQUEST FOR REVIEW AND COMMENT

In consideration of the information provided above, your participation is requested with the following:

1. **review and comment** on the SSFM strategic regional issues *draft* summary reports prepared by the regional SSFM steering committee (bullet format acceptable). A complete set of the SSFM strategic issue summary reports is provided in the second attachment accompanying this e-mail: *Kootenay/Boundary SSFM Steering Committee Issue Summary Reports*.

2. **evaluate regional SSFM issues and proposed strategies/activities** using evaluation criteria (*Appendix A*) and reporting table (*Appendix B, Table 1*). The strategies and activities proposed to address each issue have been outlined within Table 1 for your review convenience. Again, additional detail can be found in the Issue Summary Reports referred to above.

3. where applicable, **identify additional SSFM strategic knowledge/information needs** – keeping in mind the strategic objectives of SSFM. Use the Kootenay/Boundary Region SSFM Strategic Issue Summary reporting format provided (*Appendix C*) and identify and evaluate the *new* strategic issue(s) and associated strategies/activities within the evaluation table provided (*Appendix B, Table 2*))

4. it is recommended that, if possible, **review and reporting be co-ordinated** between MELP and MoF, licensees and stakeholders

5. the timeline for completion is **August 8, 2000**. All comments should be forwarded in electronic format to Bernie Peschke ( e-mail: Bernie.Peschke@gems1.gov.bc.ca )

## NEXT STEPS

Following receipt of review comments from districts, licensees and stakeholders, the Kootenay/Boundary SSFM regional steering committee:

- will consolidate and document review comments by management unit (i.e., TSA and TFL);
- may revise SSFM regional issues *draft* summary reports based on review comments and additional submissions and within the strategic context provided by SSFM; and,
- will provide recommendations to FRBC of regional SSFM priority issues, activities/strategies and funding.

If you have any questions or require additional clarification, please do not hesitate to call Dennis Hamilton, SSFM Regional Contract Coordinator (352-4665); Bernie Peschke, MoF (354-6271); or, Kathy Eichenberger, MELP (354-6349).

Thank you in advance for your attention to this request.

Kootenay/Boundary SSFM Regional Steering Committee

## *Appendix A: Kootenay/Boundary SSFM Strategic Regional Issues Evaluation Criteria* (apply to issue evaluations in Tables 1 & 2 in *AppendixB*)

The major categories for consideration during evaluation of SSFM strategic issues and associated strategies/activities include:

- **URGENCY** – (timeframes for Kootenay/Boundary Land Use Plan, Higher Level Plan, Timber Supply Reviews)
- **BENEFITS** – (sustainability, reduction in uncertainty/risk to environment, increase in certainty about sustainability of harvest, scope of benefits (landscape unit/number of landscape units/regional/provincial), timeframe (immediate/long term), support)
- **PROBABILITY OF SUCCESS** – (timing, complexity, expertise required, obstacles, etc.)

## *Appendix B: Kootenay/Boundary SSFM Strategic Issue Evaluation Tables 1 and 2*

### TABLE 1: Kootenay/Boundary SSFM Steering Committee *draft* Strategic Issues (*__no__ order of priority*)

(use with evaluation criteria from *Appendix A* and details provided in strategies/activities section of the table. More detail on each issue can be found in the SSFM Issue Summary Reports (*Attachment 2*))

***District:*** ***Contact(s):***

| **SSFM Strategic Issue** | **Issue Evaluation Rating (H, M or L)**[2] | | | **Strategies/Activities** | **Strategy/Activity Evaluation Rating (H, M or L)** | | |
|---|---|---|---|---|---|---|---|
| | **Urgency** | **Benefits** | **Probability of Success** | | **Urgency** | **Benefits** | **Probability of Success** |
| **spatial analysis** | | | | • assessment of historic and current spatial planning initiatives, databases and results | | | |
| | | | | • standardized approach for applying Higher Level Plan rules and determining netdowns | | | |
| | | | | • 'benchmarking' studies of various spatial models to determine each model's 'functionality' | | | |
| | | | | • ARCINFO data base | | | |
| | | | | • standardized economic indicators and analysis outputs | | | |
| | | | | • Technical team to develop detailed work plan and select 2 management units for analysis | | | |
| | | | | | | | |
| **structural attribute definitions of old and mature** | | | | • produce standardized methodology (Standard Operating Procedure/RIC) | | | |
| | | | | • BEC unit sampling (based on methodology from previous works) | | | |

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[2] H=high M=moderate L=low

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| | | | | • fire history and stand re-construction studies in IDFdm1 | | | |
| | | | | | | | |
| **Landscape Unit Planning** | | | | • committee to define GIS reporting needs linked to Strategic Land Use Plan and Land Use Plan objectives | | | |
| | | | | • access to current MELP and MoF GIS land use planning GIS data sets | | | |
| | | | | • define and develop program reporting with ministries and industry | | | |
| | | | | • training in use of desktop application software | | | |
| | | | | • deploy desktop software | | | |
| | | | | | | | |
| **Landscape Unit Planning: old and mature forest** | | | | • office and field training session | | | |
| | | | | • aerial flights to assess candidate old and mature forest stands | | | |
| | | | | • spreadsheet summary and ranking of candidate areas | | | |
| | | | | | | | |
| **maintaining sufficient old and mature within the landscape** | | | | • 1:50,000 sub-zone mapping in Kootenay Lake, Cranbrook, Invermere and Boundary (in order of priority) | | | |
| | | | | • modeling of Higher Level Plan OGMA rules and assessment of implications for timber, HLP objectives and old growth | | | |
| | | | | • establish old forest 'natural range of variability' by BEC | | | |
| | | | | | | | |
| **site series and Predictive Ecosystem Mapping (PEM)** | | | | • large scale BEC sub-zone mapping for Kootenay Lake, Cranbrook, Boundary and remainder of Invermere forest districts | | | |
| | | | | • PEM for Boundary, Kootenay Lake and Cranbrook forest districts and PEM for portions of Columbia and Invermere forest districts | | | |

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| **TSR inputs for operability limits** | | | | • update lines using forest development plans, silviculture prescriptions, total chance plans, air photo interpretation and target field checks | | | |
| | | | | | | | |
| **TSR inputs for unstable terrain** | | | | • develop a method for reconnaissance level avalanche mapping and netdown procedure<br>• repeat analysis conducted for Cranbrook TSR in time for other management unit TSRs | | | |
| | | | | | | | |
| **TSR inputs for Operational Adjustment Factors (OAF)** | | | | • establish Steering Committee (Forest Practices Branch, regional experts) and produce action plan<br>• design sampling system based on size and variability of stand types | | | |
| | | | | | | | |
| **TSR and partial cutting** | | | | • establish steering and sub-committees to develop partial cutting action plans for issues (i.e., PROGNOSIS, growth and yield needs and model functionality<br>• develop detailed project plans (i.e., research, analyses and extension) | | | |
| | | | | | | | |
| **Mountain caribou** | | | | • caribou habitat capability and suitability mapping is required<br>• refine or confirm existing mapping using capability/suitability mapping, telemetry and modeling<br>• inventory and monitor populations<br>• analyses for use in guideline refinement<br>• assess management options with respect to population recovery – implement recovery<br>• analysis of perturbation affects | | | |
| | | | | | | | |
| **Grizzly bear** | | | | • detailed avalanche track mapping | | | |

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|---|---|---|---|---|---|---|---|
| | | | | • access management planning | | | |
| | | | | • scale dependent habitat distribution maps and population estimates | | | |
| | | | | • forage supply models and guidelines | | | |
| | | | | • refined/confirmed habitat management guidelines | | | |
| | | | | • denning habitat mapping | | | |
| | | | | • habitat mapping and habitat supply models | | | |
| | | | | | | | |
| **ungulate winter range** | | | | • ungulate winter range regional steering committee needs to be established | | | |
| | | | | • winter range inventory, research and analysis needs to be completed – including identification of baseline habitat attribute identification | | | |
| | | | | • ungulate winter range habitat capability/suitability mapping needs to be completed along with habitat supply modeling tools | | | |
| | | | | • ungulate winter range guidelines need to be evaluated and refined | | | |
| | | | | • habitat and population monitoring | | | |
| **fisheries** | | | | • reconnaissance level fish inventories conducted in combination with FHAT20 modeling | | | |
| | | | | | | | |
| **water quality, quantity and timing of flow in community and domestic watersheds** | | | | • continue water quality monitoring in selected watersheds to provide data for statistically valid analyses | | | |
| | | | | • data analysis and consultation for coordination of water quality and stream flow data with Interior Watershed Assessment Procedure and ECA results | | | |
| | | | | • develop water user's 'tool kit' for water and channel monitoring during construction and development activities | | | |
| | | | | • calibration of existing bioassessment produres to regional resident ecology | | | |
| | | | | • develop water quality objectives (4 watersheds) | | | |
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## *TABLE 2: Proposed SSFM Strategic Issues*

(to be completed for **new** proposed SSFM strategic issues. The new issues, knowledge needs, products, strategies and activities, costs, and performance indicators should first be detailed (**1-2 pages maximum**) in the SSFM strategic issue summary reporting format provided in *Appendix C*)

***District:*** ***Contact(s):***

| **NEW** **SSFM Strategic Issue** | **Issue Evaluation Rating (H, M or L)**[2] | | | **Proposed Strategies/Activities** | **Proposed Strategy/Activity Evaluation Rating (H, M or L)** | | |
|---|---|---|---|---|---|---|---|
| | **Urgency** | **Benefits** | **Probability of Success** | | **Urgency** | **Benefits** | **Probability of Success** |
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## *Attachment C: Kootenay/Boundary SSFM Strategic Issue Summary Reporting Format*

**District: Boundary**
**Contact: Jeff Leahy, Walter Hyashi MoF, Rick Heinrichs MoELP, Randy Waterous P&T**

### TITLE Fish Stream Data Management

### BACKGROUND

- There is a need to consolidate FRBC Fish and Fish Habitat Inventory info as well as other fish steam information throughout the Boundary District.
- The risk of not not this is poor decisions, potential of duplication of data.
- A consolidated fish stream data set will allow for better analysis and the ability to model riparian impacts as they relate to timber supply and landscape unit planning.

### KNOWLEDGE NEEDS/GAPS

- This project will allow existing information to be better utilized by agencies and licencees.

### PRODUCTS/OBJECTIVES

- The product will be a data set that can be used for analytical purposes.

### ACTIVITIES/STRATEGIES

- Agencies and licensees will need to work cooperatively to gather all existing data sources

### ESTIMATED COST

- Cost will be approximately $39,000
- Data will be in GIS format to allow for ease of maintenance of data and to facilitate analysis

### IMPLEMENTATION STRATEGY

- This data will allow for reliable analysis of riparian/fish stream issues

### PERFORMANCE INDICATORS

- Fish stream data set will be clean

# Appendix 5d, Strategic Regional Issues Draft Review Request Feedback

## Wynndel Logging Co.

We feel that the following issues should be addressed through further inventories (FRBC funded):

Community & Domestic Water Use
Terrain Stability
Forest Health
Fisheries Information
Biodiversity
Green-up

Reason being is that these issues are all constraints to timber development and may cause poor forestry practices.

## Marcie Belcher (Crestbrook Forest Industries)

I have briefly reviewed the SSFM Strategic Issues Summary Report and offer the following comments / questions. I apologize if these comments are a bit late.

1) - the 15 issues identified - does this mean that resource inventory projects only relating to these 15 would be eligible for funding next year or would the category listing supplied last year still apply?

2) SIBEC Sampling - site index data correlation to the Biogeoclimatic site series classification (BEC)
- has not been identified
- relates to TSR input
- as per last year's comments: "new information / tool to better assign tree species site index by ecological units. Data will support all TSR's and enable better overall strategic Land Management"
- as a priority, I would think SIBEC is higher than the other inputs listed
-- Operability Limits / Unstable Terrain

3) Problem Forest Type - Inventory
- has not bee identified
- relates to TSR input
- inventory/ assesment of dense pine forest types has and should be done to provide valuable and accurate information that will supply strategic guidance to forest management options. The baseline data may be used with additional information as an adjustment factor in the forest inventory.

4) Water Quality, Quantity and Timing of Flow in Community and Domestic Watersheds

- just as a note, water quality / quantity monitoring has been identified as a priority and is occurring in areas outside of community and domestic watersheds ie. relating to the fisheries resource. This should be identified.

5) AOA work is not identified anywhere

The planners have indicated to Marcie that they are still a priority from their perspectives as well. Before Phase Two of this years provincial Planning Model is completed (Issue Identification) we recommend that these be included in the initial lists, and therefore be considered in the process for what becomes priority.

**Jennifer Yeow**

Thank you for the opportunity to comment on the Strengthening Sustainable Forest Management (SSFM) Strategic Issues Summary Report. The issues you've cited are critical and it is appropriate to include water quality.
I'd like to submit that the most pressing need is that the various government, industry and community start working together and address issues in a coordinated way rather than each group seeking to promote its own agenda.
We have to recognize the interrelated nature of issues and adopt Ecosystem Based Forest management, long term planning to preserve forest and aquatic values and monitor the stream to insure we're doing it right. Unfortunately the Forest Practices Code does not give clear direction here so has been up to regional agencies & industry to protect non-timber values.
Specifically, I'd like to comment on the two issues where I have some experience - fisheries and water quality. As a member of the Columbia Kootenay Fisheries Partnership I am aware that fisheries reconnaissance work including assessments are important but, without the interest and support of local people from the community, there is little hope of preserving fish stocks in the face of industrial and human development.
I would urge you to include local conservation groups when conducting inventories and to support programs that promote stewardship. Here, it might make sense to work closer with our fisheries group and I've sent your issues paper to other members of our committee.
Regarding the issue of water quality, the concern and commitment to carry out monitoring best lies with those who live near the water sources.
We all benefit when community members participate in data collection because:
1. It enables people to learn how watersheds function and become advocates for their protection based on factual data.
2. It promotes partnerships between government, industry and community
3. It provides the long term data needed for water and forest management
4. It is based on tried and true "low tech" techniques established by Water Survey Canada
5. It is cost effective

The Slocan Valley program has been collecting data for 4 years. Our experience confirms that monitoring should include stream channel assessments, flow, the physical parameters

- sediment, turbidity and temperature and fecal coliform bacteria. The biological assessments including metals, nutrients and benthos may be useful for creeks with high fisheries value for the purpose of gathering reference data but we don't think they are required at most stations.

Regarding the need for rapid assessment methods and the possibility of using EPA protocol. Our experience confirms what many experts have stressed, namely, processes in nature are variable, require long term study and it is best to concentrate on a few parameters and measure them well.
In line with FRBC's approach, I'd say the way to bridge the government - community gap is by strengthening sustainable community groups (SSCG).
Thank you for accepting my comments.

**Paul Jeakins (Arrow IFPA Program Manager)**

Thank you for the opportunity to provide further feedback on the SSFM RMP process. As you are probably aware, the Arrow IFPA is a licensee lead initiative that has strong partnerships with MoF, MELP, FRBC and experts and specialists across the province. We have some comments on the process and the projects sent out for review.

Unfortunately, licensees are somewhat under represented on the SSFM RMP Committee. And there isn't a lot of opportunity to bring forward a regional licensee perspective, more an individual licensee perspective in the meetings. Of course that is not for lack of trying and hopefully you will receive a number of comments from licensees or the ILMA on the projects and process.

I have talked with Jane, Milt, Lynn Husted and our licensee technical committee representatives on this topic as well having attended the first RMP committee meeting. As the IFPA has put forth at the meetings, we are pursuing a sustainable forest management initiative that has a number of provincial experts working with us. So you will have to take my comments on the process with a grain of salt as I am coming at this from the perspective of developing a truly sustainable forest management framework.

The RMP guideline that Lynn contributed to clearly sets out what is expected in this process. It states that the focus of this strategic objective is to address three main things, sustainable forest management, certification and higher level plan issues. In order to focus on any of those things, a strategic plan is needed. The projects proposed seem to be individual in nature and do not link to a strategic plan for sustainable forest management or certification. They seem to have some links to the KBLUP, but they aren't addressing the bigger picture around implementation of a higher level plan. It still appears as if they are individual inventories that should be tethered to a central project that links them all in some strategic way.

A number of the projects have a lot in common with IFPA projects that are already underway. One of the things we should undertake is a clear integration of overlapping initiatives. These projects include:

Ungulate Winter Range
PEM
Maintaining sufficient Old and Mature forest in the landscape
LU Planning - old growth and mature forest
Structural attribute definitions of old and mature forests
Spatial analysis
TSR inputs for operability limits
TSR inputs for OAFs
Partial cutting and TSR
Maintaining water quality, quantity and timing of flow in Community and
Domestic watersheds

I think there is a big opportunity here to really strengthen sustainable forest management. I strongly suggest that one of the suggested RMP projects is a strategic look at how all these projects will interact or fit together in a comprehensive way. The IFPA has done a lot of homework on that subject and will continue to help.

**Geoff Bekker (Pope & Talbot)**

Comments On The SSFM Strategic Regional Issues Draft Summary Reports

Structural Attribute Definitions of Old and Mature Forests

- Efforts are needed make the ground based work, and score cards, applicable to aerial sampling or photo interp work. The majority of the sampling/inventorying of old and mature will not be done on the ground, but via heli rece's

Landscape Unit Planning – Application tools

- As LURS seems to be the only workable tool at this time for developing Biodiversity reports, there needs to be a commitment to fix some of the problems with it, and to develop new reports needed for Landscape unit planning. Presently the required reports described in the LUPG can not be produced in full.

**John Pollack (MoF)**

…some thought needs to be given to the following:

1. We really need to take two steps back when evaluating this document, and decide what the SSFM program is designed to accomplish. We are focussing on strategic plans, TSRs and HLPs, and if the words are; " capacity to use the info, not just have it", "make better use of existing info", "tools to link inventory info to decisions" and "tools to monitor the impacts of decisions/plans", then we need to look at a number of the projects and ask the following questions:

First, are there projects that generate new inventory information that is absolutely critical for the implementation of TSRs and the HLP? If so, it economic to fix it over a short period of time so it can be used in the HLP and TSR 3? A good example of one of these would be the confirmation/tuneup of the BEC linework, which is a pretty cheap project, could be used immediately, and has huge implications for all sorts of values - both timber and nontimber - if it's wrong. On the opposite end of the spectrum is the collection of water quality data in the absence of a strategic plan to use it.

Second, strategic analyses/tools that have high value, need to be identified and sifted out of the current mass of proposals. Here too the fundamental question must be asked, "Can we use this stuff in the near future?"

I suggest on the 22nd that we shortlist the list of proposals to represent 150% of the available funding. Do we have any idea as to the size of the fluid budget for 2001/02?

2. Spatial Analysis Project:

- Include as the first bullet under background, the following " Experience with spatial analyses, suggest the wood flow from a management unit may actually be substantial less than when evaluated using aspatial, TSR methods and models. If this is correct, the impact of the HLP guidelines on wood flow may have been underestimated."
- Under cost estimates, change the first year costs to $300-350 k of which 50% is expected from MYAs.
- This issue was ID'd as a priority during our MoF Forest Sciences district tours.

3. Structural Attribute Definitions of Old and Mature Forests

- Activities include three projects, each of which is different in priority. The really burning issue for the HLP and LU planning is to provide guidance next spring, on the aerial criteria for selecting OGMAs. If I understand the timeframe correctly, the proposal for BEC unit sampling will take several years and while important, is much less so than spring 2001 training and criteria for the LUP OGMA selection.
- RIC methodology is lower, and fire history studies in the IDFdm1 is lowest.

4. Landscape Unit Planning - Application Tools

- Agree this is a high priority for HLP implementation
- This issue was ID'd as a priority during our Forest Sciences tour of the MoF districts.

5. Maintaining Sufficient Old and Mature Forests

- Again, I see several pooled projects which are quite different
- The priority should be given to confirming the 1:50 k BEC mapping.
- Establishing patterns/rates of natural disturbance is important but the use of this information will remain controversial. First question to ask is whether the Biodiversity Committee is reopening the debate on SRIs. If the answer is yes, then the seral stage #'s should be removed from the HLP and SSFM can consider funding this work. But it is more of an advanced research project than it is strategic planning and inventory, and it will have to be done to a high standard.
- I am uncertain why we are dealing with mapping several LUs when most of the literature on SRIs suggest big areas are required. If the BGB uses variants, then we're talking a regional design that samples the variant where it occurs. Detailed work in a couple of LUs may not be worth much.

6. Site Series and Predictive Ecosystem Mapping

- Again, priority should be given to the 1:50 k BEC mapping

7. TSR inputs for Operability Limits

- Important but can it be delayed one year, until 2002/03? I believe the districts have this in-hand for TSR 2 and will move onto LUP and HLP priorities before restarting this work.

8. TSR Inputs for Unstable Terrain

- Important but see #7.

9. TSR Inputs for Operational Adjustment Factors

- I believe the project intends to establish V&D studies in managed, not immature stands.
- The Armillaria root disease issue will be determined shortly by the Chief Forester for Kootenay Lake.
- Lower priority - very big $, no PSP data, and a long term payoff.

10. Partial Cutting and TSR

- Clearly a priority but the work on this subject concluded there are substantial modeling problems with FSSIM that must be overcome before we can use partial cutting in anything but a general analog in TSR. There is no easy fix.
- I see this as a provincial TSB/FPDS/RIB project rather than a regional one.
- Good idea but does the proponent of this project know what they're tackling?

11. Mountain Caribou

- Big ticket, with lots of $ for inventory and research. Can we do more with mapping/management guidelines up front, for less $?
- Suggest we add a climate change component to this one and ask the brutal question about certain populations in the face of climate change . Population recovery may be irrelevant in the face of the trends noted in the face of the PNW component of the US National discussion paper on climate change.

12. Grizzly Bear

- I am uncertain whether mapping av. tracks was ever intended in the HLP.
- Probably bit ticket and longer term. Any HLP / TSR priorities that can be addressed with a more focussed program?

13. Ungulate Winter Range

- If we're monitoring guidelines and then modifying them with adaptive management, much of this proposal is very long term.
- Costs?

14. Fisheries

- Essentially a $600 k inventory project for the first several years. Total value is $2.5 - $2.7 million by my estimate.

- Is there a fall-back of lesser value that would help refine this important area?

15. Water Quality

- This project is worth $900+ k.
- I believe some of hydrologists have major concerns about large expenditures in the absence of good design, e.g. paired watersheds and the like. These hydrologists (Toews) suggest that 90% of the fluctuations seen in water quality, is attributable to natural (seasonal and storms) variation and less than 10% is due to management. Accordingly, while much of the intent portrayed in this submission is admirable, both the public and FRBC must recognize that a shotgun approach to monitoring may provide limited returns. An expert review of this issue is desperately needed.
- Some of the work is very long term, as per the suggestion to select 2 pilot watersheds and track them over the life of the FDP. I believe we have a number of these situations, monitored, already.

Summary: Clearly the above projects need to be considered in light of the goals of the SSFM program, and the ability for certain components to contribute to improvements in the TSR, LUP or HLP, in a reasonable length of time.

## *HIGH PRIORITY REGIONAL SSFM ISSUES*

### Spatial Analysis (SA)

| ISSUE NO. | RANK | PROJECT, ACTIVITY, STRATEGY | PROJECT STATUS[1] | TYPE OF KNOWLEDGE INVESTMENT[2] | TYPE OF BENEFIT[3] | SCOPE OF BENEFITS[4] | TIMING OF BENEFITS[5] | ABILITY TO USE KNOWLEDGE[6] | DATE PROJECT COMPLETION REQUIRED? | PROBABILITY OF SUCCESS[7] | POTENTIAL SOURCE OF FUNDING[8] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SA1 | H | Detailed workplan development | N | E<br>U | E<br>T<br>NT | R | S<br>L | HLP<br>TSR<br>LUP | 00/01 | H | RIP<br>HIP |
| SA2 | H | ARCINFO data base | N | E<br>U | E<br>T<br>NT | R | S<br>L | HLP<br>TSR<br>LUP | ¾ | H | RIP<br>HIP |
| SA3 | H | Netdown determinations and HLP rules | N | E<br>U | E<br>T<br>NT | R | S<br>L | HLP<br>TSR<br>LUP | ¾ | H | RIP<br>HIP |
| SA4 | H | Assessment of historic and current spatial planning initiatives, databases and results | N | E<br>U | E<br>T<br>NT | R | S<br>L | HLP<br>TSR<br>LUP | ¾ | H | RIP<br>HIP |
| SA5 | H | Benchmarking studies of various spatial models to determine their functionality | N | E<br>U | E<br>T<br>NT | R | S<br>L | HLP<br>TSR<br>LUP | ¾ | H | RIP<br>HIP |
| SA6 | H | Standardized economic indicators and output analysis | N | E<br>U | E<br>T<br>NT | R | S<br>L | HLP<br>TSR<br>LUP | ¾ | H | RIP<br>HIP |

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[1] (E) Existing, (N) New

[2] (E) Organization, Synthesis, Analysis of Existing Info, (U) Tools, Applications, Extension to Enhance Use of Existing Information, (N) Field Inventory or Research

[3] (E) Environmental values, (T) Timber resource benefits, (NT) Non-timber resource benefits. There may be more than one type of benefit

[4] Number of Management Units, (R) Region, (P) Province

[5] (S) Short-term - less than five years, (L) Longer-term

[6] Strategic decision process or implementation of plans: SLUP (i.e., Regional, LRMP), TSR2, TSR3

[7] (H) Proven techniques, (L) unproven technique/methodology

[8] (RIP) Regional Investment Plan, (RE) Research Program, (HIP) Forest Renewal Headquarters Investment Plan, (CLUPE)

# APPENDIX 5E

## Funding Information – Spatial Analysis

| ISSUE NO. | INVESTMENT TO DATE ($$) | INVESTMENT TO DATE (YEARS) | $ REQ'D 2001/02 | $ REQ'D 2002/03 | $ REQ'D 2003/04 | $ REQ'D 2004/05 | TOTAL | TOTAL YEARS REQUIRED TO COMPLETE[9] |
|---|---|---|---|---|---|---|---|---|
| SA1 | $175,000 | 1 | $175,000 | $175,000 | 0 | 0 | $525,000 | 3 |

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[9] Includes number of years to date

APPENDIX 5E

## Structural attribute definitions for old and mature forests (OMF)

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of benefits | Timing of Benefits | Ability to use knowledge | Date project completion required? | Probability of success | Potential source of funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OMF1a | H | ESSFdk and wc4 | N | E<br>U<br>N | E<br>T<br>NT | R | S<br>L | HLP<br>LUP | 02/03 | H | RIP |
| OMF1b | H | ICHwk1 | N | E<br>U<br>N | E<br>T<br>NT | R | S<br>L | HLP<br>LUP | 02/03 | H | RIP |
| OMF1c | H | MSdm1 | N | E<br>U<br>N | E<br>T<br>NT | R | S<br>L | HLP<br>LUP | 02/03 | H | RIP |
| OMF1d | M | ICHvk1 and IDFdm1 | N | E<br>U<br>N | E<br>T<br>NT | R | S<br>L | HLP<br>LUP | 02/03 | H | RIP |

Funding Information – Structural attribute definitions for old and mature forests

| Issue No. | Investment to date ($$) | Investment to date (Years) | $ req'd 2001/02 | $ req'd 2002/03 | $ req'd 2003/04 | $ req'd 2004/05 | Total | Total years required to complete |
|---|---|---|---|---|---|---|---|---|
| OMF1a | | | $100,000 | 0 | 0 | 0 | $100,000 | 1 |
| OMF1b | | | $50,000 | 0 | 0 | 0 | $50,000 | 1 |
| OMF1c | | | $50,000 | 0 | 0 | 0 | $50,000 | 1 |
| OMF1d | | | 0 | $100,000 | 0 | 0 | $100,000 | 2 |

APPENDIX 5E

## Landscape Unit planning for old and mature forests (LUP)

| ISSUE NO. | RANK | PROJECT, ACTIVITY, STRATEGY | PROJECT STATUS | TYPE OF KNOWLEDGE INVESTMENT | TYPE OF BENEFIT | SCOPE OF BENEFITS | TIMING OF BENEFITS | ABILITY TO USE KNOWLEDGE | DATE PROJECT COMPLETION REQUIRED? | PROBABILITY OF SUCCESS | POTENTIAL SOURCE OF FUNDING |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LUP1a | H | Office and field training | N | U | E<br>T<br>NT | R | S<br>L | HLP<br>LUP | 02/03 | H | RIP |
| LUP1b | H | Aerial flights to assess candidate stands | N | U<br>N | E<br>T<br>NT | R | S<br>L | HLP<br>LUP | 02/03 | H | RIP |
| LUP1c | H | Summary and ranking of candidate areas | N | E | E<br>T<br>NT | R | S<br>L | HLP<br>LUP | 02/03 | H | RIP |

Funding Information – Landscape Unit Planning For Old And Mature Forests

| ISSUE NO. | INVESTMENT TO DATE ($$) | INVESTMENT TO DATE (YEARS) | $ REQ'D 2001/02 | $ REQ'D 2002/03 | $ REQ'D 2003/04 | $ REQ'D 2004/05 | TOTAL | TOTAL YEARS REQUIRED TO COMPLETE |
|---|---|---|---|---|---|---|---|---|
| LUP1a | | | $10,000 | $10,000 | 0 | 0 | $20,000 | 2 |
| LUP1b | | | $120,000 | $70,000 | 0 | 0 | $190,000 | 2 |
| LUP1c | | | $20,000 | $20,000 | 0 | 0 | $40,000 | 2 |

## Mountain Caribou

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to use Knowledge | Date project completion required? | Probability of success | Potential source of funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CAR1 | H | Caribou Regional Committee | N | E | E<br>T | #MU | S | HLP<br>Guidelines<br>TSR<br>LUP | 3 | H | CLUPE<br>RIP |
| CAR2a | M | Telemetry studies-Central Rockies sub-population | E | N | E<br>T | 4 MU | S<br>L | HLP<br>TSR<br>Guidelines | 3 | H | RIP |
| CAR2b | H | HSI's-central rockies | N | N | E<br>T | 4 MU | S<br>L | HLP<br>TSR<br>Guidelines | 3 | H | RIP |
| CAR2c | H | Atlas/Simfor Modelling (guideline refinement) | E<br>N | U | E<br>T | R | S<br>L | HLP<br>TSR<br>Guidelines | 3 | M<br>H | CLUPE<br>RIP<br>RE |
| CAR2d | H | Population census/monitoring | E<br>N | N | E | | S<br>L | | Indefinite | H | RIP |
| CAR2e | H | Baseline mapping refinement (PEM/TEM) | E<br>N | U<br>N | E | R | | | | | |
| CAR2f | H | Stand Attribute database | N | N | E | | | | | | |
| CAR2g | H | Capability/ suitability mapping | E<br>N | U<br>N | E<br>NT | | | | | | |
| CAR2h | M-H | Populatoin Augmentation strategy | E | N | E | | S<br>L | | Indefinite | L<br>M | RE |
| CAR2i | M-H | Effects of perturbation | E | E | E<br>T<br>NT | | S<br>L | Guidelines | Indefinite | M<br>H | CLUPE<br>RIP |
| CAR2j | H | recreational and commercial access planning | | | | | | | | | |

## APPENDIX 5E

Funding Information – Mountain Caribou

| ISSUE NO. | INVESTMENT TO DATE ($$) | INVESTMENT TO DATE (YEARS) | $ REQ'D 2001/02 | $ REQ'D 2002/03 | $ REQ'D 2003/04 | $ REQ'D 2004/05 | TOTAL | TOTAL YEARS REQUIRED TO COMPLETE |
|---|---|---|---|---|---|---|---|---|
| CAR1 | $10,000 | 1 | $50,000 | $25,000 | $25,000 | 0 | $100,000 | 3 |
| CAR2a | $1.2million | 1-10+ | $50,000 | $50,000 | $50,000 | 0 | $150,000 | 3 |
| CAR2b | $30,000 | 0 | | | $30,000 | | $30,000 | 1 |
| CAR2c | $60,000 | 3 | $90,000 | $60,000 | $30,000 | 0 | $180,000 | 3 |
| CAR2d | $80,000 | 3-10+ | $30,000 | $30,000 | $30,000 | $30,000 | $120,000 | 4 |
| CAR2e | $100,000 | 5+ | $200,000 | $100,000 | | | $300,000 | 3 |
| CAR2f | $200,000 | 5+ | $100,000 | $100,000 | $100,000 | $100,000 | $400,000 | 4 |
| CAR2g | $90,000 | 2 | $50,000 | | | $50,000 | $100,000 | 4 |
| CAR2h | | | | | | | | |
| CAR2i | In House | 8-10 | $30,000 | $30,000 | $30,000 | $30,000 | $120,000 | |
| CAR2j | | | $100,000 | $60,000 | | | $160,000 | 2 |

APPENDIX 5E

## Ungulate Winter Range

| ISSUE NO. | RANK | PROJECT, ACTIVITY, STRATEGY | PROJECT STATUS | TYPE OF KNOWLEDGE INVESTMENT | TYPE OF BENEFIT | SCOPE OF BENEFITS | TIMING OF BENEFITS | ABILITY TO USE KNOWLEDGE | DATE PROJECT COMPLETION REQUIRED? | PROBABILITY OF SUCCESS | POTENTIAL SOURCE OF FUNDING |
|---|---|---|---|---|---|---|---|---|---|---|---|
| UWR1 | H | ungulate winter range regional committee | N | E<br>U | E<br>T | P<br>R | S<br>L | HLP<br>TSR<br>LUP<br>Guidelines | 3 | H | RIP<br>CLUPE |
| UWR2a | | telemetry studies | E, N | N, E | E,T | R | S, L | FPC, HLP, guidelines | | H | RIP |
| UWR2b | | population censuses | E | U, N | E | R | L | | | H | RIP |
| UWR2c | | TEM/PEM baseline ecosystem mapping | E, N | N | E, T, NT | R | L | HLP, Guidelines | 3 | H | RIP |
| UWR2d | | stand level habitat attribute field data sampling | N | E, N | E, T | R | S, L | FPC, HLP, Guidelines, TSR | 3+ | H | RIP<br>CLUPE |
| UWR2e | | capability and suitability mapping | E, N | U, N | E, T | R | L | FPC, HLP, TSR, Guidelines | 3 | H | RIP |
| UWR3 | | ATLAS/SIMFOR habitat supply modeling | E | U | E, T | R | L | TSR, Guidelines | 3 | H | RIP<br>CLUPE |
| UWR4 | | stand and landscape level guidelines | E | E, U | E, T | R | S, L | TSR, HLP, Guidelines | 3 | H | RIP |
| UWR5 | | access planning | E | E, U | E, T, NT | R | L | E, NT | | M-H | RIP<br>CLUPE |

Funding Information – Ungulate Winter Range

| ISSUE NO. | INVESTMENT TO DATE ($$) | INVESTMENT TO DATE (YEARS) | $ REQ'D 2001/02 | $ REQ'D 2002/03 | $ REQ'D 2003/04 | $ REQ'D 2004/05 | TOTAL | TOTAL YEARS REQUIRED TO COMPLETE |
|---|---|---|---|---|---|---|---|---|
| UWR1 | | | $50,000 | $25,000 | $25,000 | | $100,000 | 3 |
| UWR2a | $500,000 | 5+ | $300,000 | $300,000 | | | $600,000 | 2 |
| UWR2b | | 5+ | $60,000 | | $60,000 | | $120,000 | on-going every 2-4 yrs. |
| UWR2c | $100,000 | 2+ | $250,000 | | | | $250,000 | |
| UWR2d | | | $100,000 | $100,000 | $50,000 | $50,000 | $300,000 | 5+ |
| UWR2e | $60,000 | | | $150,000 | | | $150,000 | |
| UWR3 | $60,000 | 2 | $80,000 | $50,000 | $50,000 | | $180,000 | |
| UWR4 | | | $30,000 | $30,000 | | | $60,000 | 2+ |
| UWR5 | $65,000 | 10+ | $50,000 | $30,000 | $30,000 | | $110,000 | on-going |

APPENDIX 5E

## Maintaining water quality, quantity and timing of flow (W)

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of benefits | Timing of Benefits | Ability to use knowledge | Date project completion required? | Probability of success | Potential source of funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| W1b | H | GPS 122 CWS water Intake location using contract mapping | N | N | E<br>NT | R | S | TSR, HLP, Landscape level P, ***FDP***, all other resource users | Prior to forest development; 2003 | H | RIP |
| W1c | H | GPS 30 springs that met the intent of CWS but are not part of the list of Known Information | N | N | E<br>NT | R | S<br>L | TSR, HLP, ***Landscape level P***, FDP, all other resource users | Prior to landscape planning 2003 | H | RIP |
| W1d | H,M,L components | GPS 6500 DWS water Intake locations using contract mapping. | N | N | E<br>NT | R | L | TSR, ***HLP***, Landscape level P, FDP, all other resource users | Prior to implementation of EZRA's | M | RIP |
| W2a | H | Alluvial/Debris Flow Fan Hazard Assessment Procedure | N<br>E (1998 project funded to identify fans; see W2b) | U | NT (reduce risk of damages to people and property) | KBLUP Imp. Strategy 35.2<br>P | S | TSR, Landscape Level Plans, FDP | 2001 | M | RIP |
| W2b | H | Alluvial/Debris Flow Fan Identification Project Phase 2 | N (extension of 1998 FRBC Project) | N | NT (reduce risk of damages to people and property) | KBLUP Imp. Strategy 35.1<br>R | S | TSR, Landscape Level Plans, FDP | 2004 | H | RIP |
| W3 | M | Peak Flow Impacts of Forest Harvesting Practices | N | N<br>U | E<br>NT (assess risk to downslope people and property) | KBLUP Imp. Strategy 51.4.1 and 35.2<br>P | L | TSR, Landscape Level Plans, FDP | 2010 | H | RIP<br>RE |
| W4 | M | Assessment of Sediment Delivery from Roads to Streams | N | N<br>U | E | P | S | FDP | 2005 | M | RIP<br>RE |

## APPENDIX 5E

### Funding Information – Maintaining Water Quality, Quantity and Timing of Flow

| ISSUE No. | INVESTMENT TO DATE ($$) | INVESTMENT TO DATE (YEARS) | $ REQ'D 2001/02 | $ REQ'D 2002/03 | $ REQ'D 2003/04 | $ REQ'D 2004/05 | TOTAL | TOTAL YEARS REQUIRED TO COMPLETE |
|---|---|---|---|---|---|---|---|---|
| W1a | By industry $? | 1996-2000 | ~$30,000 | ~$20,000 | ~$20,000 | ~$20,000 | Continuing at $20,000 per year | Ongoing |
| W1b | $20,000 | 1998 | ~$100,000 | ~$100,000 | | | ~$200,000 | 2 |
| W1c | 0 | 0 | ~$50,000 | | | | ~$50,000 | 1 |
| W1d | 0 | 0 | ~$1,050,000 | ~$1,050,000 | ~$1,050,000 | ~$1,050,000 | ~$10,500,000 | 10 |
| W2a | 0 | 0 | $47,400 | | | | $47,400 | 1 |
| W2b | $125,000 | 2 | $168,300 | $168,300 | | | $461,600 | 2 |
| W3 | 0 | 0 | $105,000 | $30,000 | $30,000 | $50,000 | $215,000 | 10 |
| W4 | 0 | 0 | $117,000 | $40,000 | $40,000 | $100,000 | $297,000 | 4 |

## *MEDIUM PRIORITY REGIONAL SSFM ISSUES*

### Maintaining sufficient old and mature forest within the landscape (OMA)

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to Use Knowledge | Date Project Completion Required? | Probability of Success | Potential Source of Funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OMA2a | H | Large scale (1:50000) BEC mapping | E | E | E<br>T<br>NT | 4 MU | S<br>L | LUP | 01/02 | H | RIP |
| OMA2b | L-M | Model and evaluate patterns of OGMA resulting from HLP rule applications | N | E<br>U | E<br>T<br>NT | R | S<br>L | LUP<br>TSR | 02/03 | H | RIP |
| OMA2c | M | Investigate methods for establishing natural range of variability | N | U<br>N | E<br>T<br>NT | R | S<br>L | LUP | 02/03 | M | RIP |

Funding Information – Maintaining Sufficient Old and Mature Forests within the Landscape

| Issue No. | Investment to Date ($$) | Investment to Date (Years) | $ Req'd 2001/02 | $ Req'd 2002/03 | $ Req'd 2003/04 | $ Req'd 2004/05 | Total | Total Years Required to Complete |
|---|---|---|---|---|---|---|---|---|
| OMA2a | | | $160,000 | | | | $160,000 | 1 |
| OMA2b | | | | $50,000 | | | $50,000 | 4 |
| OMA2c | | | | $30,000 | | | $30,000 | 4 |

APPENDIX 5E

## Site series and Predictive Ecosystem Mapping

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to Use Knowledge | Date Project Completion Required? | Probability of Success | Potential Source of Funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PEM1 | H | Large scale (1:50000) BEC mapping | E | E | E<br>T<br>NT | 4 MU | S<br>L | LUP | ½ | H | RIP |
| PEM2 | M | Complete PEM for Nelson Forest Region | E | U<br>N | E<br>T<br>NT | R | S<br>L | LUP<br>TSR | 04/05 | M | RIP |

## Funding Information – Site Series and Predictive Ecosystem Mapping

| Issue No. | Investment to date ($$) | Investment to date (Years) | $ Req'd 2001/02 | $ Req'd 2002/03 | $ Req'd 2003/04 | $ Req'd 2004/05 | Total | Total Years Required to Complete |
|---|---|---|---|---|---|---|---|---|
| PEM1 | | | $160,000 | | | | $160,000 | 1 |
| PEM2 | | | | $200,000 | $200,000 | $200,000 | $600,000 | 4 |

APPENDIX 5E

## Fisheries

| ISSUE NO. | RANK | PROJECT, ACTIVITY, STRATEGY | PROJECT STATUS | TYPE OF KNOWLEDGE INVESTMENT | TYPE OF BENEFIT | SCOPE OF BENEFITS | TIMING OF BENEFITS | ABILITY TO USE KNOWLEDGE | DATE PROJECT COMPLETION REQUIRED? | PROBABILITY OF SUCCESS | POTENTIAL SOURCE OF FUNDING |
|---|---|---|---|---|---|---|---|---|---|---|---|
| F1 | H | Recon. 1:20k Fish and Fish Habitat Inventory | E<br>N | E<br>T<br>NT | R | L | KBLUP, TSR, Certification system, all other resource users | Prior to forest development |  | H | No other source |
| F2 | M-H | FHAT20 modeling program | E<br>U | E<br>T | Existing inventoried areas | S | TSR | Prior to forest development |  | M | No other source |
| F3 | M | Bull trout telemetry | N | E<br>T<br>NT | Depends on distribution of species | L | KBLUP, Road construction current mngmt polices and regulations, access mngmt., Certification system | Any time |  | H | HCTF<br>FRBC<br>BPA |

## Funding Information - Fisheries

| ISSUE NO. | INVESTMENT TO DATE ($$) | INVESTMENT TO DATE (YEARS) | $ REQ'D 2001/02 | $ REQ'D 2002/03 | $ REQ'D 2003/04 | $ REQ'D 2004/05 | TOTAL | TOTAL YEARS REQUIRED TO COMPLETE |
|---|---|---|---|---|---|---|---|---|
| F1 | Approximately $4.2 million | 1996-2000 | ~$600,000 | ~$550,000 | ~$450,000 | ~$300,000 | ~$6,100,000 | 9 |
| F2 | 0 | N/A | ~$40,000 | ~$40,000 | ~$40,000 | ~$40,000 | ~$160,000 | 4 |
| F3 | ~$20,000 | 2000 | ~$100,000 | ~$120,000 | ~$120,000 | ~$150,000 | ~$510,000 | 5 |

APPENDIX 5E

## Timber Supply Review inputs for unstable terrain (TSRt)

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to Use Knowledge | Date Project Completion Required? | Probability of Success | Potential Source of Funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TSRt1a | M | Repeat piloted analysis for other management units | E | E<br>U | E<br>T | R | S<br>L | TSR | 04/05 | H | RIP |
| TSRt1b | L-M | Research to develop a method for reconnaissance level avalanche hazard mapping | N | N | E<br>T | R | S<br>L | TSR | 04/05 | M | RIP<br>RE |

## Funding Information – TSR Inputs for Unstable Terrain

| Issue No. | Investment to Date ($$) | Investment to Date (Years) | $ Req'd 2001/02 | $ Req'd 2002/03 | $ Req'd 2003/04 | $ Req'd 2004/05 | Total | Total Years Required to Complete |
|---|---|---|---|---|---|---|---|---|
| TSRt1a | | | $65,000 | $65,000 | $65,000 | $65,000 | $260,000 | 4 |
| TSRt1b | | | | $50,000 | $50,000 | $50,000 | $150,000 | 4 |

APPENDIX 5E

## Timber Supply Review and partial cutting (TSRp)

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to use Knowledge | Date project completion required? | Probability of success | Potential source of funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TSRp1a | M | Establish committee to develop action plan for identified issues | N | E | E<br>T | R<br>P | S<br>L | LUP<br>TSR | ½ | H | RIP |
| TSRp1b | M | Develop detailed project plans required to bring each issue to necessary resolve | N | E | E<br>T | R<br>P | S<br>L | LUP<br>TSR | ½ | M | RIP |

## Funding Information – TSR and Partial Cutting

| Issue No. | Investment to date ($$) | Investment to date (Years) | $ req'd 2001/02 | $ req'd 2002/03 | $ req'd 2003/04 | $ req'd 2004/05 | Total | Total years required to complete |
|---|---|---|---|---|---|---|---|---|
| TSRp1a | | | 0 | 0 | 0 | 0 | 0 | |
| TSRp1b | | | 0 | 0 | 0 | 0 | 0 | |

## Rare and endangered species

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to Use Knowledge | Date Project Completion Required? | Probability of Success | Potential Source of Funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RE1 | H | Species Specific Inventories[10] | E<br>N | N | E<br>NT | R | S<br>L | TSR, SLUP, FPC (Identified Wildlife Strategy) | 2003 ongoing | H | RIP |
| RE2 | M | Grassland Reconnaissance Surveys[11] | N | N | E<br>NT | R | S<br>L | TSR, SLUP, FPC (Identified Wildlife Strategy) | 2003 ongoing | H | RIP |
| RE3 | M | Rock Cliff Reconnaissance Surveys[12] | N | N | E<br>NT | R | S<br>L | TSR, SLUP, FPC (Identified Wildlife Strategy) | 2003 ongoing | H | RIP |
| RE4 | M | "Montane" Meadow Plant Species Reconnaissance Surveys[13] | N | N | E<br>NT | R | S<br>L | TSR, SLUP, FPC (Identified Wildlife Strategy) | 2003 ongoing | H | RIP |
| RE5 | M | "Range" Reconnaissance Plant Surveys[14] | N | N | E<br>NT | R | S<br>L | TSR, SLUP, FPC (Identified Wildlife Strategy) | 2003 ongoing | H | RIP |
| RE6 | H | Linking Identified Wildlife to Mapping Initiatives (PEM/Washington and Oregon Wildlife Habitat relationships | N | E | E<br>NT | R | S | TSR, SLUP, FPC (Identified Wildlife Strategy) | 2002 | H | RIP<br>HIP |

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[10] Tailed Frog (R; IDW); Coeur d'Alene Salamander (R); Northern Leopard Frog (R; nf); Western Screech-owl, marfarlanei ssp. (R); Williamson's Sapsucker, nataliae spp. (R); Least Chipmunk, selkirki spp. (R; nf); Badger (R): esp. 'southern sub-pop' (Cranbrook FD); Northern Long-eared Myotis (B); Lewis's Woodpecker (B; IDW); Red-tailed Chipmunk, ruficaudus ssp. (R); Least Chipmunk, oreocetes ssp. (R; nf); Red-tailed Chipmunk, simulans ssp. (R); Northern Pocket Gopher, segregatus ssp. (R; nf); Western Grebe (R; IDW; nf in Koot); Upland Sandpiper (R); Forester's Tern (R; nf); Yellow-breasted Chat (R; IDW); Grasshopper Sparrow (R; IDW); Am. White Pelican (R; IDW; nf in Koot.); Swainson's Hawk (R)

[11] **Grassland Reconnaissance Surveys** for Grasshopper Sparrow, Peregrine Falcon, Prairie Falcon,Yellow-breasted Chat, Long-billed Curlew Lewis's Woodpecker, Bobolink, Sharp-tailed Grouse,

[12] **Rock Cliff Reconnaissance Surveys** for Peregrine Falcon, Prairie Falcon, White-throated Swift, Canyon Wren;

[13] **"Montane" Meadow Plant Species Reconnaissance Surveys** for: a) Sweet-marsh butterweed ( Senecio foetidus, vars. foetidus and hydrophiloides) (both vars. R), b) Easter Daisy (Townsendia exscapa) (R), c) Hookers townsendia (Townsendia hookeri) (R);**"Range" Reconnaissance Plant Surveys** for a) Scarlet Gaura (Gaura coccinea) (R), b) Flat-topped Broomrape (Orobanche corymbosa, spp. mutabilis) (R), c) Blue Gamma (Bouteloua gracilis) (R)

[14] **"Range" Reconnaissance Plant Surveys** for a) Scarlet Gaura (Gaura coccinea) (R), b) Flat-topped Broomrape (Orobanche corymbosa, spp. mutabilis) (R), c) Blue Gamma (Bouteloua gracilis) (R)

# APPENDIX 5E

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to Use Knowledge | Date Project Completion Required? | Probability of Success | Potential Source of Funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | project) | | | | | | | | | |

## Funding Information – Rare and Endangered Species

| Issue No. | Investment to Date ($$) | Investment to Date (Years) | $ Req'd 2001/02 | $ Req'd 2002/03 | $ Req'd 2003/04 | $ Req'd 2004/05 | Total | Total Years Required to Complete |
|---|---|---|---|---|---|---|---|---|
| RE1 | $150,000 | 5 | $60,000 | $60,000 | $60,000 | $60,000 | $240,000 | 10 |
| RE2 | 0 | 0 | $30,000 | | | | $30,000 | 1 |
| RE3 | 0 | 0 | | $30,000 | | | $30,000 | 1 |
| RE4 | 0 | 0 | | | $30,000 | | $30,000 | 1 |
| RE5 | 0 | 0 | $30,000 | | | | $30,000 | 1 |
| RE6 | 0 | 0 | $30,000 | | | | $30,000 | 1 |

APPENDIX 5E

## Grizzly Bear

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to Use Knowledge | Date Project Completion Required? | Probability of Success | Potential Source of Funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GB1 | H | Avalanche Mapping Projects | E<br>N | E<br>N | E<br>T | R | S<br>L | R | 2002-3 | H | RIP |
| GB2 | H | Population Estimates & Discrimination | E<br>N | N | E | R | S<br>L | R | 2004 | H | RIP |
| GB3 | M | Scale Dependent | N | U | E<br>T | R | S<br>L | R | 2002-3 | N | RIP |
| GB4 | H | Confirm Habitat Guidelines | N | E | E<br>T | R | S<br>L | R | 2002-3 | H | RIP |
| GB5 | M | Forage Supply Models | N | E | E | R | S<br>L | R | 2002-3 | M | RIP<br>HIP |
| GB6 | L | Denning Area Identifictaion | N | N | E | R | S<br>L | R | 2003 | M | RIP<br>HIP |
| GB7 | M | Atlas/Simfor Habitat Supply Models | N | U | E<br>T | R | S<br>L | R | 2002-3 | M | RIP<br>HIP |
| GB8 | H | Access Mgmt Planning | N | E | E<br>NT<br>T | R | S<br>L | R | 2002-3 | H | RIP |

## Funding Information – Grizzly Bear

| Issue No. | Investment to Date ($$) | Investment to Date (Years) | $ Req'd 2001/02 | $ Req'd 2002/03 | $ Req'd 2003/04 | $ Req'd 2004/05 | Total | Total Years Required to Complete |
|---|---|---|---|---|---|---|---|---|
| GB1 | $150,000 | 3 | $100,000 | $50,000 | | | $150,000 | 5 |
| GB2 | $150,000 | 5 | $50,000 | $100,000 | $100,000 | $100,000 | $350,000 | 9 |
| GB3 | -- | 0 | $50,000 | $50,000 | | | $100,000 | 2 |
| GB4 | -- | 0 | $20,000 | $10,000 | | | $30,000 | 2 |
| GB5 | -- | 0 | | $30,000 | $20,000 | | $50,000 | 2 |
| GB6 | -- | 0 | | $30,000 | $20,000 | | $50,000 | 2 |
| GB7 | -- | 0 | | $50,000 | $40,000 | $10,000 | $100,000 | 3 |
| GB8 | -- | 0 | $20,000 | $10,000 | | | $30,000 | 2 |

APPENDIX 5E

## Landscape Unit Planning analytical tools

| Issue No. | Rank | Project, Activity, Strategy | Project Status | Type of Knowledge Investment | Type of Benefit | Scope of Benefits | Timing of Benefits | Ability to use Knowledge | Date Project Completion Required? | Probability of Success | Potential Source of Funding |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LUP2a | M | Establish working group to define reporting needs linked to SLUP/LUP objectives | N | E | T | R<br>P | S<br>L | LUP<br>TSR | 01/02 | H | CLUPE<br>RIP |
| LUP2b | M | Develop programing for production of reports | N | U | T | R | S<br>L | LUP<br>TSR | 02/03 | H | CLUPE<br>RIP |
| LUP2c | M | Deploy and train operational planners in use of desk top applications software | N | U | T | R | S<br>L | LUP<br>TSR | 02/03 | H | CLUPE<br>RIP |

## Funding Information – LUP Analytical Tools

| Issue No. | Investment to Date ($$) | Investment to Date (Years) | $ Req'd 2001/02 | $ Req'd 2002/03 | $ Req'd 2003/04 | $ Req'd 2004/05 | Total | Total Years Required to Complete |
|---|---|---|---|---|---|---|---|---|
| LUP2a | | | 0 | 0 | 0 | 0 | | |
| LUP2b | | | $75,000 | 0 | 0 | 0 | $75,000 | 1 |
| LUP2c | | | 0 | $20,000 | 0 | 0 | $20,000 | 2 |

## *LOW PRIORITY REGIONAL SSFM ISSUES*

Two strategic SSFM issues were ranked low by the regional planning team; these were (1) TSR inputs for operability inputs and (2) TSR inputs for Operational Adjustment Factors (OAFs). Although no summary table has been completed for these issues, Appendix IV provides the summary report information as prepared by the regional planning team.

APPENDIX 6

# Cranbrook Forest District
# Current Reforestation
# For the 2001/02 Fiscal Year

| Activities | Five-year Plan Goals (ha) | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Planning/surveys/prescriptions | 1500 | 1500 | 1500 | 0 | 0 | $17 | $25,000 | H |
| 2 Site preparation | 20 | 50 | 50 | 0 | 0 | 900 | 18,000 | H |
| 3 Planting | 0 | 20 | 50 | 0 | 0 | 0 | 0 | |
| 4 Brushing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals hectares** | 1520 | 1570 | 1600 | 0 | 0 | 28 | 43,000 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Total funding** | | | | | | | 43,000 | |

Priority is critical, high, moderate, low

Comment: Program next year is to accomplish site preparation on one block in the Red fire(1979). Planning, survey and prescription work is needed on some regen./free growing and current fire activities. Depending on what we find with the fire ground the program may grow exponentially.

The fire season of 2000 has burned up some plantations that we may be prepared to submit sowing requests for this fall if that is possible. At this time no estimate is available of the extent, by mid September we should have a good idea.

APPENDIX 6

# Invermere Forest District
# Current Reforestation
# For the 2001/02 Fiscal Year

| Activities | Five-year Plan Goals (ha) | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|
| | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Planning/surveys/prescriptions | 8342 | 32 | 40 | 40 | 20 | $27 | $224,233 | H |
| 2 Site preparation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Planting | 87 | 25 | 25 | 15 | 15 | 827 | 71,949 | C |
| 4 Brushing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other - netting & maintenance | 239 | 150 | 150 | 150 | 150 | 687 | 164,211 | C |
| **Totals hectares** | 8668 | 207 | 215 | 205 | 185 | 53 | 460,393 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Total funding** | | | | | | | 460,393 | |

Priority is critical, high, moderate, low

APPENDIX 6

# Columbia Forest District
# Current Reforestation
# For the 2001/02 Fiscal Year

| | Activities | Five-year Plan Goals (ha) | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 | Planning/surveys/prescriptions | 575 | 43 | 0 | 0 | 0 | $30 | $17,250 | M |
| 2 | Site preparation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 | Planting | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 | Brushing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 | Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 | Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 | Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | **Totals hectares** | 575 | 43 | 0 | 0 | 0 | 30 | 17,250 | |
| | Seedling purchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | **Total funding** | | | | | | | 17,250 | |

Priority is critical, high, moderate, low

APPENDIX 6

# Arrow Forest District
# Current Reforestation
# For the 2001/02 Fiscal Year

| | Five-year Plan Goals (ha) | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|
| **Activities** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Planning/surveys/prescriptions | 0 | 0 | 0 | 0 | 0 | $0 | $0 | |
| 2 Site preparation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Planting | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 Brushing | 3 | 0 | 0 | 0 | 0 | 333 | 1,000 | H |
| 5 Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals hectares** | 3 | 0 | 0 | 0 | 0 | 333 | 1,000 | |
| Seed purchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Total funding** | | | | | | | 1,000 | |

Priority is critical, high, moderate, low

APPENDIX 6

# Boundary TSA
## Current Reforestation
## For the 2001/02 Fiscal Year

|  | Activities | Five-year Plan Goals (ha) |  |  |  |  | Annual Plan 2001/02 |  |  |
|---|---|---|---|---|---|---|---|---|---|
|  |  | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 | Planning/surveys/prescriptions | 0 | 0 | 0 | 0 | 0 | $0 | $0 |  |
| 2 | Site preparation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 3 | Planting | 6 | 0 | 0 | 0 | 0 | 600 | 4,000 | High |
| 4 | Brushing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 5 | Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 6 | Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 7 | Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
|  | **Totals hectares** | 6 | 0 | 0 | 0 | 0 | 666 | 4,000 |  |
|  | Seedling purchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
|  | **Total funding** |  |  |  |  |  |  | 4,000 |  |

Priority is critical, high, moderate, low

planting for old trespass 82E 19 85
are is planned to be sitepreped this September.

APPENDIX 6

# Kootenay Lake Forest District
# Current Reforestation
# For the 2001/02 Fiscal Year

| | Five-year Plan Goals (ha) | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|
| **Activities** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($000) | Priority C, H, M, L |
| 1 Planning/surveys/prescriptions | 200 | 100 | 150 | 400 | 100 | $35 | $7,000 | M |
| 2 Site preparation | 174 | 170 | 84 | 84 | 84 | 566 | 98,400 | H |
| 3 Planting | 147 | 167 | 110 | 110 | 110 | 525 | 77,175 | C |
| 4 Brushing | 164 | 160 | 160 | 160 | 160 | 550 | 90,200 | H |
| 5 Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals hectares** | 685 | 597 | 504 | 754 | 454 | 398 | 272,775 | |
| Seed purchase (no. of trees) | 213300 | 260000 | 180000 | 180000 | 180000 | 0 | 64000 | C |
| **Total funding** | | | | | | | 336,775 | |

Priority is critical, high, moderate, low

**Notes:**

Surveys/planning 2001, includes funds for mapping fires from 2000
Site prep 2001: burning 84 ha. @850; snag falling 90 ha. @300 = $98400
Planting 2001: 117 ha. Agreement Lands; 30 ha. Sanca fire
Planting 2002: 117 ha. Agreement Lands; 50 ha. Tochy fire
Surveys 2004: 4th year stocking surveys on all 2000 fires + Agreeement Land stocking

12/5/2005

APPENDIX 6

# Nelson Forest Region
# Current Reforestation
# For the 2001/02 Fiscal Year

|  | Five-year Plan Goals (ha) |  |  |  |  | Annual Plan 2001/02 |  |  |
|---|---|---|---|---|---|---|---|---|
| **Activities** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($000) | Priority C, H, M, L |
| 1 Planning/surveys/prescriptions | 10617 | 1675 | 1690 | 440 | 120 | $26 | $273,483 | H |
| 2 Site preparation | 194 | 220 | 134 | 84 | 84 | 600 | 116,400 | H |
| 3 Planting | 240 | 212 | 185 | 125 | 125 | 638 | 153,124 | C |
| 4 Brushing | 167 | 160 | 160 | 160 | 160 | 546 | 91,200 | H |
| 5 Max. density spacing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 6 Studies | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 7 Other (Netting & Mice.) | 239 | 150 | 150 | 150 | 150 | 687 | 164,241 | C |
| **Totals hectares** | 11457 | 2417 | 2319 | 959 | 639 | 70 | 798,448 |  |
| Seed purchase - # of Seedlings (k) | 213 | 260 | 180 | 180 | 180 | 300 | 64000 |  |
| **Total funding** |  |  |  |  |  |  | 862,448 |  |

Priority is critical, high, moderate, low

# Cranbrook Forest District
# Forest Health Maintenance Activities
# For the 2001/02 Fiscal Year

**Protection of Current Inventory Sub-Program:**

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Surveys | ha | 4200 | 4200 | 4200 | 4200 | 4200 | 32 | $134,400 | C |
| 2 Defoliator spraying | ha | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Aerial Survey - overview | ha | 500000 | 500000 | 500000 | 500000 | 500000 | | | |
| 4 Aerial Surveys - detailed | ha | 5000 | 5000 | 5000 | 5000 | 5000 | | | |
| **Totals hectares** | | 4200 | 4200 | 4200 | 4200 | 4200 | | | |
| | | | | | | | | | |
| 5 Aerial Survey - overview | hrs flying time | 8 | 8 | 8 | 8 | 8 | 400 | 3,200 | C |
| 6 Aerial Surveys - detailed | hrs flying time | 12 | 12 | 12 | 12 | 12 | 800 | 9,600 | C |
| 7 Fall and burn treatment | trees | 990 | 990 | 990 | 990 | 990 | 50 | 49,500 | C |
| 8 MSMA treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 Pheromone baiting | trees | 1500 | 1500 | 1500 | 1500 | 1500 | 4 | 6,000 | C |
| 10 Studies | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 11 Other - Trap Trees | trees | 300 | 300 | 150 | 0 | 0 | 75 | 22,500 | |
| **Totals** | | 516210 | 516210 | 516060 | 515910 | 515910 | $1,361 | $225,200 | |

Priority is critical, high, moderate, low
It is suggested as a default to use the numbers submitted in the 2000/01 Bark Beetle Allocation / Budgeting process for all 5 yrs of this plan.
However, if it is expected that the activities will increase or decrease due to declining or expanding pest populations, the plan should reflect this expectation.

**Forest Health Information Sub-program:**

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Survey | ha | 1000 | 1000 | 1000 | 1000 | 1000 | 25 | $25,000 | M |
| **Totals hectares** | | 1000 | 1000 | 1000 | 1000 | 1000 | | | |
| | | | | | | | | | |
| 2 Aerial Survey - overview* | hrs flying time | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Studies/ Operational Trials: | | | | | | | | | |
| 3 · Hazard and risk | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 · Impact analyses (G&Y) | number | 1 | 1 | 1 | 1 | 1 | 25,000 | 25,000 | M |
| 5 · Treatments | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Training Courses | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals** | | 2001 | 2001 | 2001 | 2001 | 2001 | $25,025 | $50,000 | |

Priority is critical, high, moderate, low

* - reported in this sub-program only if district has no protection of current inventory sub-program

# Invermere Forest District
# Forest Health Maintenance Activities
# For the 2001/02 Fiscal Year

**Protection of Current Inventory Sub-Program:**

| Activities | Units | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Surveys | ha | 2000 | 2000 | 2000 | 2000 | 2000 | $90 | $180,000 | C |
| 2 Defoliator spraying | ha | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Aerial Survey - overview | ha | 1045000 | 1045000 | 1045000 | 1045000 | 1045000 | | | |
| 4 Aerial Surveys - detailed | ha | 50000 | 50000 | 50000 | 50000 | 50000 | | | |
| **Totals hectares** | | 2000 | 2000 | 2000 | 2000 | 2000 | | | |
| 5 Aerial Survey - overview | hrs flying time | 25 | 25 | 25 | 25 | 25 | 400 | 10,000 | C |
| 6 Aerial Surveys - detailed | hrs flying time | 40 | 40 | 40 | 40 | 40 | 1,000 | 40,000 | C |
| 7 Fall and burn treatment | trees | 100 | 100 | 100 | 100 | 100 | 50 | 5,000 | H |
| 8 MSMA treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 Pheromone baiting | trees | 10000 | 10000 | 10000 | 10000 | 10000 | 3 | 30,000 | C |
| 10 Studies | number | 1 | 1 | 1 | 1 | 1 | 30,000 | 30,000 | |
| 11 Other | | | | | | | | 110,000 | C |
| **Totals** | | 1109166 | 1109166 | 1109166 | 1109166 | 1109166 | $31,543 | $405,000 | |

Priority is critical, high, moderate, low

It is suggested as a default to use the numbers submitted in the 2000/01 Bark Beetle Allocation / Budgeting process for all 5 yrs of this plan

However, if it is expected that the activities will increase or decrease due to declining or expanding pest populations, the plan should reflect this expectation

Note "other" includes mapping, hazard rating, trap trees and bark beetle management plan projects

**Forest Health Information Sub-program:**

| Activities | Units | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Survey | ha | 100 | 100 | 100 | 100 | 100 | $50 | $5,000 | M |
| **Totals hectares** | | 100 | 100 | 100 | 100 | 100 | | | |
| 2 Aerial Survey - overview* | hrs flying time | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Studies/ Operational Trials | | | | | | | | | |
| 3 - Hazard and risk | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 - Impact analyses (G&Y) | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 - Treatments | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Training Courses | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals** | | 200 | 200 | 200 | 200 | 200 | $50 | $5,000 | |

Priority is critical, high, moderate, low

* - reported in this sub-program only if district has no protection of current inventory sub-program

# Columbia Forest District
# Forest Health Maintenance Activities
# For the 2001/02 Fiscal Year

**Protection of Current Inventory Sub-Program:**

| Activities | Units | Five-year Plan Goals 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Annual Plan 2001/02 Unit Cost ($) | Funding ($) | Priority C, H, M, L |
|---|---|---|---|---|---|---|---|---|---|
| 1 Ground Surveys | ha | 1600 | 1600 | 1600 | 1600 | 1600 | $13 | $21,000 | H |
| 2 Defoliator spraying | ha | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Aerial Survey - overview | ha | 450000 | 450000 | 450000 | 450000 | 450000 | | | |
| 4 Aerial Surveys - detailed | ha | 50000 | 50000 | 50000 | 50000 | 50000 | | | |
| **Totals hectares** | | 1600 | 1600 | 1600 | 1600 | 1600 | | | |
| 5 Aerial Survey - overview | hrs flying time | 12 | 12 | 12 | 12 | 12 | 417 | 5,000 | C |
| 6 Aerial Surveys - detailed | hrs flying time | 30 | 30 | 30 | 30 | 30 | 1,000 | 30,000 | C |
| 7 Fall and burn treatment | trees | 200 | 200 | 200 | 200 | 200 | 44 | 8,800 | H |
| 8 MSMA treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 Pheromone baiting | trees | 50 | 50 | 50 | 50 | 50 | 5 | 250 | H |
| 10 Studies | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 11 Other | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals** | | 503492 | 503492 | 503492 | 503492 | 503492 | $1,479 | $65,050 | |

Priority is critical, high, moderate, low
It is suggested as a default to use the numbers submitted in the 2000/01 Bark Beetle Allocation / Budgeting process for all 5 yrs of this plan
However, if it is expected that the activities will increase or decrease due to declining or expanding pest populations, the plan should reflect this expectation
Note: No bark beetle activities and funding are planned within Parks

**Forest Health Information Sub-program:**

| Activities | Units | Five-year Plan Goals 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Annual Plan 2001/02 Unit Cost ($) | Funding ($) | Priority C, H, M, L |
|---|---|---|---|---|---|---|---|---|---|
| 1 Ground Survey | ha | 0 | 0 | 0 | 0 | 0 | $0 | $0 | |
| **Totals hectares** | | 0 | 0 | 0 | 0 | 0 | | | |
| 2 Aerial Survey - overview* | hrs flying time | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Studies/ Operational Trials | | | | | | | | | |
| 3 Hazard and risk | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 Impact analyses (G&Y) | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 Treatments | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Training Courses | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals** | | 0 | 0 | 0 | 0 | 0 | $0 | $0 | |

Priority is critical, high, moderate, low

* - reported in this sub-program only if district has no protection of current inventory sub-program
Note: No Forest Health Information Sub-program activities are planned

# Arrow Forest District
# Forest Health Maintenance Activities
# For the 2001/02 Fiscal Year

**Protection of Current Inventory Sub-Program:**

| Activities | Units | Five-year Plan Goals 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Annual Plan 2001/02 Unit Cost ($) | Funding ($) | Priority C, H, M, L |
|---|---|---|---|---|---|---|---|---|---|
| 1 Ground Surveys | ha | 2000 | 2000 | 2000 | 2000 | 2000 | $8 | $16,000 | H |
| 2 Defoliator spraying | ha | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Aerial Survey - overview | ha | 0 | 0 | 0 | 0 | 0 | | | |
| 4 Aerial Surveys - detailed | ha | 0 | 0 | 0 | 0 | 0 | | | |
| **Totals hectares** | | 2000 | 2000 | 2000 | 2000 | 2000 | | | |
| 5 Aerial Survey - overview | hrs flying time | 8 | 8 | 8 | 8 | 8 | 500 | 4,000 | C |
| 6 Aerial Surveys - detailed | hrs flying time | 6 | 6 | 6 | 6 | 6 | 1,000 | 6,000 | C |
| 7 Fall and burn treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 8 MSMA treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 Pheromone baiting | trees | 250 | 250 | 250 | 250 | 250 | 16 | 4,000 | H |
| 10 Studies | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 11 Other | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals** | | 4264 | 4264 | 4264 | 4264 | 4264 | $1,524 | $30,000 | |

Priority is critical, high, moderate, low
It is suggested as a default to use the numbers submitted in the 2000/01 Bark Beetle Allocation / Budgeting process for all 5 yrs of this plan
However, if it is expected that the activities will increase or decrease due to declining or expanding pest populations, the plan should reflect this expectation

**Forest Health Information Sub-program:**

| Activities | Units | Five-year Plan Goals 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Annual Plan 2001/02 Unit Cost ($) | Funding ($) | Priority C, H, M, L |
|---|---|---|---|---|---|---|---|---|---|
| 1 Ground Survey | ha | 0 | 0 | 0 | 0 | 0 | $0 | $0 | |
| **Totals hectares** | | 0 | 0 | 0 | 0 | 0 | | | |
| 2 Aerial Survey - overview* | hrs flying time | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Studies/ Operational Trials | | | | | | | | | |
| 3 Hazard and risk | number | 1 | 1 | 0 | 0 | 0 | 5,000 | 5,000 | |
| 4 Impact analyses (G&Y) | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 Treatments | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Training Courses | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals** | | 1 | 1 | 0 | 0 | 0 | $5,000 | $5,000 | |

Priority is critical, high, moderate, low

* - reported in this sub-program only if district has no protection of current inventory sub-program

# Boundary Forest District
# Forest Health Maintenance Activities
# For the 2001/02 Fiscal Year

**Protection of Current Inventory Sub-Program:**

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Surveys | ha | 5000 | 5000 | 5000 | 5000 | 5000 | $8 | $40,000 | C |
| 2 Defoliator spraying | ha | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Aerial Survey - overview | ha | 593000 | 593000 | 593000 | 593000 | 593000 | | | |
| 4 Aerial Surveys - detailed | ha | 30000 | 30000 | 30000 | 30000 | 30000 | | | |
| **Totals hectares** | | 5000 | 5000 | 5000 | 5000 | 5000 | | | |
| | | | | | | | | | |
| 5 Aerial Survey - overview | hrs flying time | 6 | 6 | 6 | 6 | 6 | 500 | 3,000 | C |
| 6 Aerial Surveys - detailed | hrs flying time | 10 | 10 | 10 | 10 | 10 | 1,000 | 10,000 | C |
| 7 Fall and burn treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 8 MSMA treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 Pheromone baiting | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 10 Studies | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 11 Other - trap tees | trees | 100 | 0 | 0 | 0 | 0 | 50 | 5,000 | H |
| **Totals** | | 633116 | 633016 | 633016 | 633016 | 633016 | $1,558 | $58,000 | |

Priority is critical, high, moderate, low

It is suggested as a default to use the numbers submitted in the 2000/01 Bark Beetle Allocation / Budgeting process for all 5 yrs of this plan.

However, if it is expected that the activities will increase or decrease due to declining or expanding pest populations, the plan should reflect this expectation.

**Forest Health Information Sub-program:**

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Survey | ha | 500 | 0 | 0 | 0 | 0 | $10 | $5,000 | M |
| **Totals hectares** | | 500 | 0 | 0 | 0 | 0 | | | |
| | | | | | | | | | |
| 2 remeasure op trial plots | 20 plots | 0 | 20 | 0 | 0 | 0 | 0 | 0 | |
| (Knappen root rot trials) | | | | | | | | | |
| 3 - Hazard and risk | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 - Impact analyses (G&Y) | number | 10 | 0 | 0 | 0 | 0 | 500 | 5,000 | M |
| 5 - Treatments | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Training Courses | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals** | | 1010 | 20 | 0 | 0 | 0 | $510 | $10,000 | |

Priority is critical, high, moderate, low

* - reported in this sub-program only if district has no protection of current inventory sub-program

# Kootenay Lake Forest District
# Forest Health Maintenance Activities
# For the 2001/02 Fiscal Year

**Protection of Current Inventory Sub-Program:**

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Surveys | ha | 2000 | 2000 | 2000 | 2000 | 2000 | $90 | $180,000 | C |
| 2 Defoliator spraying | ha | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Aerial Survey - overview | ha | 1045000 | 1045000 | 1045000 | 1045000 | 1045000 | | | |
| 4 Aerial Surveys - detailed | ha | 50000 | 50000 | 50000 | 50000 | 50000 | | | |
| **Totals hectares** | | 2000 | 2000 | 2000 | 2000 | 2000 | | | |
| | | | | | | | | | |
| 5 Aerial Survey - overview | hrs flying time | 25 | 25 | 25 | 25 | 25 | 400 | 10,000 | C |
| 6 Aerial Surveys - detailed | hrs flying time | 40 | 40 | 40 | 40 | 40 | 1,000 | 40,000 | C |
| 7 Fall and burn treatment | trees | 100 | 100 | 100 | 100 | 100 | 50 | 5,000 | H |
| 8 MSMA treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 Pheromone baiting | trees | 10000 | 10000 | 10000 | 10000 | 10000 | 3 | 30,000 | C |
| 10 Studies | number | 1 | 1 | 1 | 1 | 1 | 30,000 | 30,000 | |
| 11 Other | | | | | | | | 110,000 | C |
| **Totals** | | 1109166 | 1109166 | 1109166 | 1109166 | 1109166 | $31,543 | $405,000 | |

Priority is critical, high, moderate, low

It is suggested as a default to use the numbers submitted in the 2000/01 Bark Beetle Allocation / Budgeting process for all 5 yrs of this plan

However, if it is expected that the activities will increase or decrease due to declining or expanding pest populations, the plan should reflect this expectation

Note: "other" includes mapping, hazard rating, trap trees and bark beetle management plan projects

**Forest Health Information Sub-program:**

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Survey | ha | 100 | 100 | 100 | 100 | 100 | $50 | $5,000 | M |
| **Totals hectares** | | 100 | 100 | 100 | 100 | 100 | | | |
| | | | | | | | | | |
| 2 Aerial Survey - overview* | hrs flying time | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Studies/ Operational Trials: | | | | | | | | | |
| 3 · Hazard and risk | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 · Impact analyses (G&Y) | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 · Treatments | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Training Courses | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| **Totals** | | 200 | 200 | 200 | 200 | 200 | $50 | $5,000 | |

Priority is critical, high, moderate, low

* - reported in this sub-program only if district has no protection of current inventory sub-program

# Nelso Forest Region Office
# Forest Health Maintenance Activities
# For the 2001/02 Fiscal Year

Protection of Current Inventory Sub-Program:

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Surveys | ha | 0 | 0 | 0 | 0 | 0 | #DIV/0! | $0 | |
| 2 Defoliator spraying | ha | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 Aerial Survey - overview | ha | 0 | 0 | 0 | 0 | 0 | | | |
| 4 Aerial Surveys - detailed | ha | 0 | 0 | 0 | 0 | 0 | | | |
| **Totals hectares** | | 0 | 0 | 0 | 0 | 0 | | | |
| 5 Aerial Survey - overview | hrs flying time | 71 | 71 | 71 | 71 | 71 | 423 | 30,000 | |
| 6 Aerial Surveys - detailed | hrs flying time | 5 | 5 | 5 | 5 | 5 | 1,000 | 5,000 | |
| 7 Fall and burn treatment | trees | 0 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | |
| 8 MSMA treatment | trees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 Pheromone baiting | trees | 0 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | |
| 10 Studies | number | 0 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | |
| 11 Other | | | | | | | | 0 | |
| **Totals** | | 76 | 76 | 76 | 76 | 76 | 461 | $35,000 | |

Priority is critical, high, moderate, low

Forest Health Information Sub-program:

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Survey | ha | 0 | 0 | 0 | 0 | 0 | #DIV/0! | $0 | |
| **Totals hectares** | | 0 | 0 | 0 | 0 | 0 | | | |
| 2 Aerial Survey - overview* | hrs flying time | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Studies/ Operational Trials | | | | | | | | | |
| 3 Hazard and risk | number | 1 | 1 | 1 | 1 | 1 | 10,000 | 10,000 | |
| 4 Impact analyses (G&Y) | number | 1 | 1 | 1 | 1 | 1 | 50,000 | 50,000 | |
| 5 Treatments | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Training Courses | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 Other | | 4 | 4 | 4 | 4 | 4 | 15,000 | 60,000 | |
| **Totals** | | 6 | 6 | 6 | 6 | 6 | 19,990 | $120,000 | |

Priority is critical, high, moderate, low

# Nelson Forest Region
# Forest Health Maintenance Activities
# For the 2001/02 Fiscal Year

**Protection of Current Inventory Sub-Program:**

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Surveys | ha | 25264 | 23956 | 22648 | 21340 | 22648 | $24 | $601,170 | C |
| 2 Defoliator spraying | ha | 0 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | |
| 3 Aerial Survey - overview | ha | 3788000 | 3788000 | 3788000 | 3788000 | 3788000 | | | |
| 4 Aerial Surveys - detailed | ha | 199000 | 199000 | 199000 | 199000 | 199000 | | | |
| **Totals hectares** | | 25264 | 23956 | 22648 | 21340 | 22648 | | | |
| | | | | | | | | | |
| 5 Aerial Survey - overview | hrs flying time | 146 | 146 | 146 | 146 | 146 | 422 | 61,600 | |
| 6 Aerial Surveys - detailed | hrs flying time | 134 | 134 | 130 | 130 | 126 | 960 | 128,650 | |
| 7 Fall and burn treatment | trees | 1540 | 1490 | 1470 | 1440 | 1470 | 57 | 88,300 | |
| 8 MSMA treatment | trees | 0 | 0 | 0 | 0 | 0 | #DIV/0! | 0 | |
| 9 Pheromone baiting | trees | 13000 | 12200 | 12200 | 12200 | 12300 | 11 | 141,875 | |
| 10 Studies | number | 1 | 1 | 1 | 1 | 1 | 30,000 | 30,000 | |
| 11 Other | | | | | | | | 27,900 | |
| **Totals** | | 4052349 | 4048883 | 4046243 | 4043597 | 4046339 | 0 | $1,079,495 | |

Priority is critical, high, moderate, low

**Forest Health Information Sub-program:**

| | | Five-year Plan Goals | | | | | Annual Plan 2001/02 | | |
|---|---|---|---|---|---|---|---|---|---|
| **Activities** | **Units** | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | Unit Cost ($) | Funding ($) | Priority C, H, M, L |
| 1 Ground Survey | ha | 2400 | 1100 | 1100 | 1100 | 1100 | $0 | $0 | M |
| **Totals hectares** | | 0 | 0 | 0 | 0 | 0 | | | |
| | | | | | | | | | |
| 2 Aerial Survey - overview' | hrs flying time | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Studies/ Operational Trials | | | | | | | | | |
| 3 - Hazard and risk | number | 2 | 2 | 1 | 1 | 1 | 7,500 | 15,000 | |
| 4 - Impact analyses (G&Y) | number | 12 | 2 | 2 | 2 | 2 | 6,667 | 80,000 | |
| 5 - Treatments | number | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 Training Courses | number | 2 | 0 | 0 | 0 | 0 | 500 | 1,000 | |
| 7 Other | | 7 | 4 | 4 | 4 | 4 | 17,714 | 124,000 | |
| **Totals** | | 2423 | 1108 | 1107 | 1107 | 1107 | 91 | $220,000 | |

Priority is critical, high, moderate, low

# APPENDIX 8

## Ministry of Forests
## Resource Management Plan
## Recreation Component

April 1, 2001 to March 31, 2005

FOREST SERVICE
BRITISH COLUMBIA

compiled by
Forest Practices Branch
Forest Development Section
October 2000

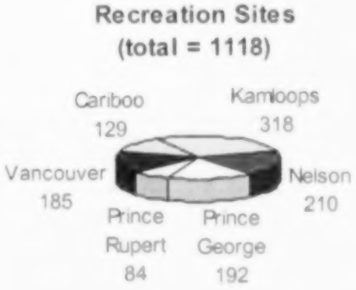
## Introduction

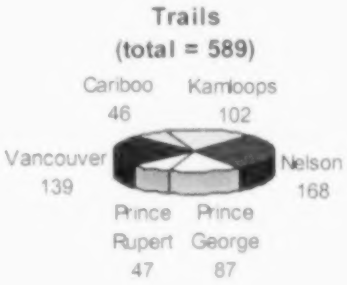
The Ministry of Forests (ministry) manages recreation resources and public use on Crown forest lands. Managing the recreation resource involves:

- maintaining an inventory of recreation features and recreation settings;
- planning for recreation; and
- incorporating recreation information into referrals for operations proposed on Crown forest lands.

To enable the public to enjoy Crown forest lands for recreation, the ministry manages,

- 1,118 recreation sites; and
- 589 recreation trails.





## Background

In 1998, no base funds were available for maintaining recreation sites and trails. The lack of site and trail maintenance resulted in an escalation of public and media complaints during the summer. In response to this situation, the ministry allocated $1.0 million to keep the recreation sites open, nothing more.

In 1999, recreation fees at sites and some trails were introduced to partly recover the cost of maintaining these facilities. (See **Appendix 1** for a description of the recreation fees). The ministry was able to provide basic maintenance at most of the recreation sites, at a cost of $2,358,000 with funding coming from three sources:

1) Revenue from the recreation fees ($392,000 camping pass and $166,000 camping permit);
2) $1.0 million ministry base funds; and
3) approximately $800,000 of risk managed base funds from other programs.

In addition $200,000 was allocated to regions for compliance and enforcement patrols, some of which was used to patrol recreation sites.

In 2000, more than 300 recreation sites were either closed or transferred to BC Parks, reducing the total number of sites managed by the ministry to 1118. The Ministry was able to provide basic maintenance at most of the recreation sites at a cost of $2,725,000 with funding coming from the following sources:

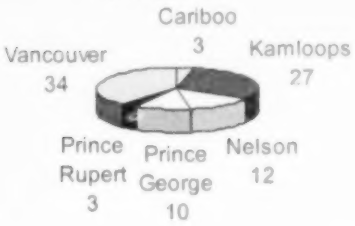
1) revenue from the recreation fees ($750,000 camping pass and $175,000 camping permits);
2) $1.0 million ministry funds; and
3) approximately $800,000 risk managed funds from other programs.

In addition $140,000 of base funds was allocated to regions for recreation site patrols.

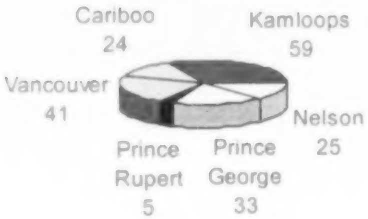
**Issues and Implications**

To date, revenue from recreation fees and funding from government have not been sufficient to manage the recreation sites to ministry standards. The lack of funding has prohibited the ministry from maintaining the infrastructure at recreation sites, estimated to be worth over $13 million. As a result there is a backlog of structure repair and replacement dating back to 1998 when funding was first cut. As an example some sites have deteriorated to the point where essential structures such as entrance signs and toilets are no longer in place.

**Number Of Recreation Sites Without A Toilet**
**(total = 89)**



**Number Of Recreation Sites Without An Entrance Sign**
**(total = 187)**



Compounding the problem of deteriorating conditions at recreation sites is a higher public expectation of service and structures at these facilities due to the fact that fees are being charged.

No funding has been dedicated to trails since 1997. The trails and the infrastructure on them are deteriorating and public safety, environmental and liability risks are escalating. The ministry will have to review the option of closing trails do to lack of funding next year.

No resources have been available to carry out recreation resource management activities except at a very cursory level.

At the time the recreation fees were introduced it was estimated that the revenue from camping pass sales would eventually cover approximately 40 to 50% of the costs of managing the recreation sites. In 1999 revenue from the camping pass sales was approximately $450,000 and is forecasted to increase to approximately $550,000 in 2000. It appears that the initial target of 40 to 50% cost recovery from camping pass sales will be very difficult to achieve. Consequently the need for more government commitment to the program is required if the existing number of recreation sites and trails are to be maintained.

## 2001-02 Priority Ranking and Funding Needs for Recreation Activities

Given the lack of funding, newly introduced user fees, higher public expectations, on-going deterioration of the infrastructure and escalating public safety, environmental and liability risks, it is critical that the RMP build the business case for public recreation opportunities managed by the ministry. In this regard, the priority ranking and funding needs for recreation activities are as follows:

### For Recreation Sites and Trails

### 1. Critical Priority

**Basic Site Maintenance**
**$2,537,000** is required to for site maintenance activities that if not carried out next year will lead to:

- significant public safety risks;
- environmental damage;
- increasing liability risks and possible court action; or
- widespread adverse publicity.

**Basic Trail Maintenance**
**$841,000** is required for trail maintenance activities that if not carried out next year will lead to:

- significant public safety risks;
- environmental damage;
- increasing liability risks and possible court action; or
- widespread adverse publicity.

**Recreation Fee Administration**
**$95,000** is required for recreation fee administration to ensure that revenue is collected to partly off-set the cost of managing the campgrounds and trails. (See **Appendix 2** for a breakdown of the administrative costs)

A total of **$3,473,000** is required for critical priority fee administration and site and trail maintenance.

### 2. High Priority

**Recreation Site Patrols**
**$433,000** is required for essential recreation site patrol activities that if not carried out year will lead to:

- significant public safety risks;
- vandalism and loss of structures at campgrounds;
- reduced compliance and less revenue from camping fees; or
- widespread adverse publicity.

**Backlog Structure Repair and Replacement (Sites)**
**$1,105,000** is required for essential "catch-up" repair and replacement of structures that have not occurred at the recreation sites since 1997 due to funding cutbacks.

**Annual Structure Repair and Replacement (Sites)**
**$1,367,000** is required for essential repair and replacement of structures that must be carried out in order to protect and maintain the ministry 's $13 million investment at the ministry's recreation sites. Note information on trail infrastructure is not available at this time.

A total of **$2,905,000** is required to carry out high priority site patrols, backlog replacement of structures and annual replacement of structures.

3. **Moderate Priority**

**Site and Trail Rehabilitation**
Activities required for monitoring and evaluating the condition of the ministry's recreation sites and trails, planning and carrying out rehabilitation at sites and trails. (**Note:** figures have not been provided for this activity at this time.)

4. **Low Priority**

**Development**
Improvements that will enhance forest recreation opportunities for the public. (**Note**: figures have not been provided for this activity at this time.)

See **Appendix 3** for provincial and regional information on site and trail management activities.

**For Recreation and Visual Landscape Management**

The following recreation and visual landscape management needs represent input from half of the districts (22 of 40 reported). Future Resource Management Plans will include more comprehensive information on recreation and visual landscape resource management needs. (Note: recreation and visual landscape inventory activities are included under the Forest Inventory component of the Resource Management Plan).

1. **High Priority**

**$271,000** is required to complete essential recreation and visual landscape resource analysis and planning that if not carried out will lead to:

- significant conflicts with other forest resources and recreation activities;
- loss of recreation and visual resource values; or
- widespread adverse publicity.

2. **Moderate Priority**
   **$259,500** is required to complete recreation and visual landscape research, operational trails and studies that if not carried out will lead to:
   - continued conflicts with other forest resources and recreation activities; or
   - loss of recreation and visual resource values

3. **Low Priority**
   **$5,000** is required to monitor recreation and visual landscape resources to enhance these resources.

See **Appendix 4** for region information on recreation and visual landscape resource management needs.

For further information on the ministry's recreation program or to answer questions concerning the information in this document, please contact Bill Marshall (387-8382) or Ward Trotter at (356-5887), Forest Practices Branch.

## APPENDIX 1: Summary of Ministry of Forest Recreation Fees

| Type Of Fee | Where Fees Apply | Fee Rate | Sold By | What Money is Used For |
|---|---|---|---|---|
| **Camping Pass** | • all campgrounds | • $27.00 (annual)<br>• $22.00 (seniors rate)<br>• $8.00 (per night) | • government agents, sub-issuers, FS offices | • money used to keep campgrounds open |
| **Enhanced Campground Fee** | • high-use campgrounds | • $10.00 (per night)<br>• Annual pass holder discount of 50% ($5.00/night) | • Contractor | • money retained by contractor to pay for enhanced services |
| **Enhanced Trail Fees** (for enhanced services, e.g., track-setting, cabins) | • about 30 trails | • locally determined | • club (non-profit group) | • money retained by club to pay for enhanced services |
| **Other Fees**<br>a) brochures<br>b) firewood | a) all districts<br>b) some campgrounds | a) between $2.00 to $4.00 (to be determined)<br>b) price range from $2.00 to $5.00 per bundle (locally determined) | a) government agents & sub-issuers<br>b) contractor or club | a) money to pay for printing and distribution of brochures<br>b) money to contractor/club to pay for provision of firewood |

## APPENDIX 2: Administrative Costs for Ministry of Forest Recreation Fees

| Item | # Printed in first run | Total cost for 2000 $ |
|---|---|---|
| Product Design | na | 5,000 |
| Annual Camping Pass | 60,000 | 15,000 |
| Single-Night Camping Pass | 20,000 | 3,000 |
| Enhanced Campground Permit | 100,000 | 5,000 |
| Fees brochures | 100,000 | 7,500 |
| Rules brochures | 100,000 | 7,500 |
| Fees posters | 5,000 | 5,000 |
| Rules posters | 5,000 | 5,000 |
| Enhanced Fees Posters | 0 | 0 |
| Campground directory | - | 2,000 |
| Advertisements | na | 40,000 |
| Disabled Stickers | 0 | 0 |
| Camping Pass Stickers | 0 | 0 |
| TOTAL | | $ 95,000 |

## Appendix 3: FS Recreation Site and Trail Management Activities for the 2001/02 Resource Management Plan

### Provincial

| | Priority Critical | | | | Priority High | | | | | | Priority Moderate | | Priority Low | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Activity | Basic Site Maintenance | | Basic Trail Maintenance | | Site Patrols | | Backlog Replacement of structures | | Annual Replacement of Structures | | Site/Trail Rehabilitation | | Site/Trail Development | | |
| District: | # | $ | # | $ | # | $ | # | $ | # | $ | # | $ | # | $ | Total $'s |
| Cariboo | 129 | 345,000 | 46 | 100,000 | 54 | 47,000 | 406 | 200,000 | 2,359 | 111,000 | | | | | |
| Kamloops | 318 | 588,000 | 102 | 165,000 | 139 | 121,000 | 1,008 | 286,000 | 4,655 | 312,000 | | | | | |
| Nelson | 210 | 292,000 | 168 | 106,000 | 54 | 48,000 | 348 | 146,000 | 2,842 | 260,000 | | | | | |
| Prince George | 192 | 347,000 | 87 | 116,000 | 55 | 48,000 | 594 | 167,000 | 2,696 | 150,000 | | | | | |
| Prince Rupert | 84 | 193,000 | 47 | 151,000 | 35 | 30,000 | 81 | 21,000 | 1,691 | 146,000 | Not included at this time | | | | |
| Vancouver | 185 | 772,000 | 141 | 203,000 | 159 | 139,000 | 633 | 285,000 | 4,574 | 388,000 | | | | | |
| Sub-total by Activity | 1,118 | 2,537,000 | 591 | 841,000 | 496 | 433,000 | 3,070 | 1,105,000 | 18,817 | 1,367,000 | | | | | |
| HQ Branch | Rec Fee Admin. | | $95,000 | | | | | | | | | | | | |
| Total by Priority | $3,473,000 | | | | $2,905,000 | | | | | | | | | | |
| Total year 02 - 03 | 3,820,000 | | | | $1,980,000 | | | | | | | | | | |
| Total year 03 - 04 | 4,202,000 | | | | $2,178,000 | | | | | | | | | | |
| Total year 04 - 05 | 4,623,000 | | | | $2,396,000 | | | | | | | | | | |

| | |
|---|---|
| **Basic Maintenance** | is defined as clean out houses, tidy rake area, clean firepits, minor repairs to structures, pump toilets, collect garbage and manage hazard trees<br># refers to numbers of campgrounds and day use sites |
| **Basic Trail Maintenance** | is defined as clearing windfall, hazard trees and bush, maintaining trail tread and minor repairs to structures and markers.<br># refers to number of trails |
| **Site Patrols** | # refers to number of patrol days (2 person 8 hours shift)<br># covers overtime costs |
| **Backlog Replacement** | of structures are for sites only, trail structures are not included at this time. |
| **Annual Replacement** | of structures is based on a 10-year expected life of structures and so equals 10% of the total value of the structures. |

**Total Years 2002-2005**

- Priority high includes site patrols and annual replacement of structures (backlog replacemernt of structures addressed in 2001-2002).
- Figures in year 2002 - 2005 increase 10% per year

## APPENDIX 4: Recreation / Visual Landscape Management for the 2001-02 Resource Management Plan

| | # Districts | PRIORITY HIGH | | PRIORITY MODERATE | | PRIORITY LOW | |
|---|---|---|---|---|---|---|---|
| **Region** | **Reported** | **#** | **$** | **#** | **$** | **#** | **$** |
| Cariboo | 0/5 | | | | | | |
| Kamloops | 2/7 | 1 | 20,000 | | | | |
| Nelson | 5/6 | 5 | 51,500 | 3 | 3,000 | | |
| Prince George | 6/8 | 5 | 59,500 | 4 | 44,000 | | |
| Prince Rupert | 4/6 | 1 | 5,000 | 5 | 125,000 | | |
| Vancouver | 5/8 | 3 | 85,000 | 2 | 12,500 | 1 | 5,000 |
| Headquarters | 1/1 | 1 | 50,000 | 1 | 75,000 | | |
| Total | | 16 | 271,000 | 15 | 259,500 | 1 | 5,000 |
| Total year 02-03 | | | 298,000 | | 285,000 | | |
| Total year 03-04 | | | 327,000 | | 313,500 | | |
| Total year 04-05 | | | 360,000 | | 345,000 | | |

Recreation / Visual Landscape Management Activities include:

- research, monitoring, operational trails and studies
- user surveys, analysis and development of data bases
- recreation, visual landscape, historic trail, access, cave and other plans

Recreation inventory activity is included under the Forest Inventory Component of the RMP

Total Years 2002 – 2005

- Figures in year 2002 – 2005 increase 10% per year

# Non-status Road Deactivation and Restoration Resource Management Plan

APPENDIX 9

| Region | District | RMP Watershed Number | Watershed Name | Project Name | Proponent | Activity | Units | Estimated Cost | Priority | Benefit to |
|---|---|---|---|---|---|---|---|---|---|---|
| N | DCB | | MATHEW CR. | MATHEW CR. | MoF | DEACT. | 15 | $ 37,500 | 1 | 2001-2002 |
| N | DCB | | GOLD/JOSEPH | GOLD CR. | MoF | DEACT. | 15 | $ 37,500 | 2 | |
| N | DCB | | VARIOUS | GALTONS | MoF | DEACT. | 16 | $ 40,000 | 3 | |
| N | DCB | | MOYIE | MOYIE RIVER | MoF | DEACT. | 15 | $ 37,500 | 4 | 2002-2003 |
| N | DCB | | SAND CR. | SAND CR. | MoF | DEACT. | 10 | $ 25,000 | 5 | |
| N | DCB | | VARIOUS | FLATHEAD RIVER | MoF | DEACT. | 60 | $ 150,000 | 6 | |
| N | DCB | | VARIOUS | ST. MARYS RIVER | MoF | DEACT. | 25 | $ 62,500 | 7 | 2003-2004 |
| N | DCB | | VARIOUS | LAMB CR. | MoF | DEACT. | 15 | $ 37,500 | 8 | |
| N | DCB | | VARIOUS | ELK RIVER | MoF | DEACT. | 10 | $ 25,000 | 9 | |
| N | DCB | | VARIOUS | WILDHORSE RIVER | MoF | DEACT. | 15 | $ 37,500 | 10 | |

| Region | District | RMP Watershed Number | Watershed Name | Project Name | Proponent | Activity | Units | Estimated Cost | Priority | Benefit to |
|---|---|---|---|---|---|---|---|---|---|---|
| Nelson | DIN | IN22 & IN28 | Moscow Creek | Moscow Creek | MOF/SBFEP | ASS | 50 km | $ 15,000 | 2 | Environment |
| Nelson | DIN | IN22 & IN28 | Moscow Creek | Moscow Creek | MOF/SBFEP | Pres. | 25 km | $ 15,000 | 2 | Environment |
| Nelson | DIN | IN22 & IN28 | Moscow Creek | Moscow Creek | MOF/SBFEP | RD | 25 km | $ 30,000 | 2 | Environment |
| Nelson | DIN | IN22 & IN28 | Moscow Creek | Moscow Creek | MOF/SBFEP | TEM | 20000 ha | $ 45,000 | 1 | Environment |

# Non-status Road Deactivation and Restoration Resource Management Plan

| Region | District | RMP Watershed Number | Watershed Name | Project Name | Proponent | Activity | Units | Estimated Cost | Priority | Benefit to |
|---|---|---|---|---|---|---|---|---|---|---|
| NFR | DCO | REVL_04000019 | Kirkup | | MoF | RD | 10 | $ 80,000 | 2 | ronment / Plantatation |
| NFR | DCO | GD_12 | Columbia Face | | MoF | RD | 10 | $ 80,000 | 1 | Environment / Plantatation |

# Non-status Road Deactivation and Restoration Resource Management Plan

| Region | District | RMP Watershed Number | Watershed Name | Project Name | Proponent | Activity | Units | Estimated Cost | Priority | Benefit to |
|---|---|---|---|---|---|---|---|---|---|---|
| RNE | DAR | AR32 | Salmo | Salmo River | MOF | RD | 35 km | $ 20,000 | 1 | Safety |
| RNE | DAR | AR13 | Lost Creek | Lost creek | MOF | RD | 12 km | $ 15,000 | 1 | Safety |
| RNE | DAR | AR13 | Lost Creek | Stag Leap | MOF | RD | 7 km | $ 12,000 | 1 | Environment |
| RNE | DAR | AR13 | Lost Creek | Lead Ceek | MOF | RD | 5 km | $ 7,000 | 1 | Environment |
| RNE | DAR | AR11 | Hidden Creek | Hidden Creek | MOF | RD | 9 km | $ 9,000 | 1 | Environment |
| RNE | DAR | AR11 | Hidden Creek | Porcupine creek | MOF | RD | 15 km | $ 10,000 | 1 | Environment |
| RNE | DAR | AR11 | Hidden Creek | Sheep Creek | MOF | RD | 30 km | $ 20,000 | 1 | Environment |

# Non-status Road Deactivation and Restoration Resource Management Plan

| Region | District | RMP Watershed Number | Watershed Name | Project Name | Proponent | Activity | Units | Estimated Cost | Priority | Benefit to | District Priority | Planning Cells |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RNE | DKL | KL_15 | Lost Ledge | Lost Ledge | MoF | RD | 67 | $ 70,000 | 1 | Infrastructure-Highway | 1 | 854,55,53,51,52,840,42,50,46 |
| RNE | DKL | KL_19 | Crawford Creek | Crawford Creek | MoF | RD | 34 | $ 36,000 | 1 | Infrastructure-Maintained Road | 2 | 1738,36,32,30,24,22,26,28,1716,14,12,10,00,06,04 |
| RNE | DKL | KL_19 | Crawford Creek | Crawford Creek | MoF | RR | 6 | $ 36,000 | 1 | Maintained Road, Safety | 2 | |
| RNE | DKL | KL_23 | East Shore | LaFrance | MoF | RD | 13 | $ 15,000 | 1 | Access | 3 | 1800,16,06,10,14 |
| RNE | DKL | KL_23 | East Shore | LaFrance | MoF | RR | 3 | $ 18,000 | 1 | EEV Proposal, Safety-Landslides | 3 | |
| RNE | DKL | KL_23 | East Shore | LaFrance | MoF | HR | 4 | $ 20,000 | 1 | Access, Safety, Water Quality | 3 | |
| RNE | DKL | KL_18 | Coffee Creek | Coffee Creek | MCC | RD | 46 | $ 48,000 | 1 | EEV Proposal, Safety-Landslides | 4 | 1058,54,62,64,70,74,72,76 |
| RNE | DKL | KL_18 | Coffee Creek | Coffee Creek | MCC | RR | 5 | $ 30,000 | 1 | EEV Proposal, Safety-Landslides | 4 | |
| RNE | DKL | KL_18 | Coffee Creek | Coffee Creek | MCC | HR | 3 | $ 15,000 | 1 | EEV Proposal, Plantation, Water | 4 | |
| RNE | DKL | KL_23 | Akokli Creek | Akokli Creek | MoF | RD | 29 | $ 31,000 | 1 | Infrastructure, Water Use | 5 | 1837,38,40,42,44,46,48,50,52,54 |
| RNE | DKL | KL_20 | Redfish Creek | Redfish Creek | MoF | RD | 7 | $ 9,000 | 1 | Infrastructure, Park Access | 6 | |
| RNE | DKL | KL_19, KL_21 | East Shore | Gray Creek | CTWB | RD | | $ - | 1 | EEV, Transportation Corridor | 7 | |
| RNE | DKL | KL_19, KL_21 | East Shore | Gray Creek | CTWB | RR | | $ - | 1 | EEV, Transportation Corridor | 7 | |
| RNE | DKL | KL_32 | Boundary | Monk Creek | JHH | RD | | $ - | 1 | EEV Proposal, Powerline, Rec | 8 | |
| RNE | DKL | KL_32 | Boundary | Boundary Creek | JHH | RD | | $ - | 2 | EEV Proposal, Recreation Site | 8 | |
| RNE | DKL | KL_32 | Boundary | Priest River | JHH | RD | | $ - | 2 | EEV Proposal, Powerline, Rec | 8 | |
| RNE | DKL | KL_11 | Lardeau River | Poplar Creek | SFP/MoF | RD | 48 | $ 49,700 | 2 | Infrastructure, Park Access | 9 | |
| RNE | DKL | KL_14 | Meadow Creek | Greyhorse Ridge | MCC | RD | 24 | $ 26,000 | 2 | Maintained Road, Water Quality | 10 | |
| RNE | DKL | KL_14 | Meadow Creek | Cooper McKian Creek | SFP | RD | 24 | $ 26,000 | 2 | Maintained Road, Water Quality | 11 | |
| RNE | DKL | KL_14 | Meadow Creek | Deception Creek | MCC | RD | 100 | $ 102,000 | 2 | Maintained Road, Water Quality | 12 | |
| RNE | DKL | KL_18 | Woodbury Creek | Woodbury Creek | MCC | RD | 8 | $ 10,000 | 2 | Infrastructure, Park Access | 13 | |
| RNE | DKL | KL_18 | Woodbury Creek | Woodbury Creek | MCC | RR | 2 | $ 12,000 | 2 | Infrastructure, Park Access | 13 | |
| RNE | DKL | KOTL_04000004 | Kaslo River | Keen Creek | SFP | RD | 15 | $ 17,000 | 1 | Infrastructure, Park Access | 14 | |
| RNE | DKL | KOTL_04000004 | Kaslo River | Keen Creek | SFP | RR | 3 | $ 18,000 | 1 | Infrastructure, Park Access | 14 | |
| RNE | DKL | KL_22 | Sitkum Creek | Sitkum Creek | SFP | RD | 4 | $ 6,000 | 1 | Infrastructure, Water Use | 15 | |
| RNE | DKL | KL_32 | Boundary | Dodge Creek | JHH | RD | 21 | $ 23,000 | 1 | Infrastructure, Water Use | 16 | |
| RNE | DKL | KL_8 | Trout Lake | Trout North | MCC | RD | 50 | $ 52,000 | 2 | EEV Proposal, Highway Corridor | 17 | |
| RNE | DKL | KL_8 | Trout Lake | Trout South | SFP | RD | 40 | $ 42,000 | 2 | Maintained Road, Water Quality | 18 | |
| RNE | DKL | KL_32 | Creston | Thompson Mountain | CFI | RD | 5 | $ 7,000 | 2 | Infrastructure, Rec Site Access | 19 | |
| RNE | DKL | KL_34 | South Summit | Char | JHH | RD | 16 | $ 18,000 | 2 | Maintained Road, Water Quality | 20 | |
| RNE | DKL | KL_34 | North Summit | Topaz | JHH | RD | 10 | $ 12,000 | 2 | Infrastructure, Highway | 21 | |
| RNE | DKL | KL_24 | Blewett | Rover Creek | KAL | RD | | $ - | 2 | EEV Proposal, Water Use | 22 | |
| RNE | DKL | KL_24 | Blewett | Gold-49 Creek | ATCO | RD | | $ - | 2 | EEV Proposal, Water Use | 23 | |
| RNE | DKL | KL_21 | Harrop Proctor | Harrop Creek | MoF | RD | 9 | $ 11,000 | 2 | Infrastructure, Water Use | 24 | |
| RNE | DKL | DUNC_05000005 | Meadow Creek | Lavina Lookout | MoF | RD | 3 | $ 5,000 | 2 | Infrastructure, maintained road | 25 | |
| RNE | DKL | KL_30 | Moyie | Glenlilly Creek | CFI/MoF | RD | 8 | $ 10,000 | 3 | Infrastructure, maintained road | 26 | |
| RNE | DKL | KL_28 | Clearwater Creek | Clearwater Creek | ATCO | RD | 6 | $ 8,000 | 2 | Maintained Road, Water Quality | 27 | |
| RNE | DKL | KL_30 | Moyie | Carroll Creek | CFI | RD | 48 | $ 50,000 | 2 | Maintained Road, Water Quality | 28 | |
| RNE | DKL | KL_30 | Moyie | Carroll Creek | CFI | RR | 3 | $ 18,000 | 2 | Maintain Access, maintained road | 28 | |
| RNE | DKL | KL_30 | Moyie | Shorty Creek | CFI | RD | 15 | $ 17,000 | 2 | Maintained Road, Water Quality | 29 | |
| RNE | DKL | KL_27 | Goat River | Leadville | CFI | RD | 10 | $ 12,000 | 3 | Infrastructure, maintained road | 30 | |
| RNE | DKL | KL_33 | Hawkins Creek | Freeman Creek | CFI | RD | 75 | $ 77,000 | 3 | Infrastructure, maintained road | 31 | |
| RNE | DKL | KL_33 | Hawkins Creek | Cold Creek | CFI | RD | 71 | $ 73,000 | 3 | Infrastructure, maintained road | 32 | |
| RNE | DKL | KL_15 | Riondel North | Riondel | MoF | RD | 1 | $ 3,000 | 3 | Infrastructure, Powerline | 33 | |

NOTE

-some drainages are submitted for EEV, they are still on this list as the upslope Ministry of Forests priorities may not be addressed

-list is given in KLFD order of priority

-costs are based on-- RD= 1000(M&D)+1000(Prescription)+1000/km for deactivation--RR=6,000/site(includes prescription)--HR=5,000/Ha(includes prescription)

-RD units are cells derived from a GIS search of "RD LOG" based on 1997(North) 1988(South) Forest Cover Maps, then subtracting FSR and Operational Road KM's

# APPENDIX 9

| Region | District | RMP Watershed Number | Watershed Name | Project Name | Proponent | Activity | Units | Estimated Cost | Priority | Benefit to |
|---|---|---|---|---|---|---|---|---|---|---|
| RNE | DCB | | MATHEW CR. | MATHEW CR. | MoF | DEACT. | 15 | $ 37,500 | 1 | 2001-2002 |
| RNE | DCB | | GOLD/JOSEPH | GOLD CR. | MoF | DEACT. | 15 | $ 37,500 | 1 | |
| RNE | DCB | | VARIOUS | GALTONS | MoF | DEACT. | 16 | $ 40,000 | 1 | |
| DCB Sub total | | | | | | | | $ 115,000 | | |
| RNE | DIN | IN22 & IN28 | Moscow Creek | Moscow Creek | MOF/SBFEP | ASS | 50 km | $ 15,000 | 2 | Environment |
| RNE | DIN | IN22 & IN28 | Moscow Creek | Moscow Creek | MOF/SBFEP | Pres. | 25 km | $ 15,000 | 2 | Environment |
| RNE | DIN | IN22 & IN28 | Moscow Creek | Moscow Creek | MOF/SBFEP | RD | 25 km | $ 30,000 | 2 | Environment |
| RNE | DIN | IN22 & IN28 | Moscow Creek | Moscow Creek | MOF/SBFEP | TEM | 20000 ha | $ 45,000 | 1 | Environment |
| DCB Sub total | | | | | | | | $ 105,000 | | |
| RNE | DCO | REVL_04000019 | Kirkup | | MoF | RD | 10 | $ 80,000 | 2 | Env. / Plantatation |
| RNE | DCO | GD_12 | Columbia Face | | MoF | RD | 10 | $ 80,000 | 1 | Safety/ Env./ Plantatation |
| DCO Sub total | | | | | | | | $ 160,000 | | |
| RNE | DAR | AR32 | Salmo | Salmo River | MOF | RD | 35 km | $ 20,000 | 1 | Safety |
| RNE | DAR | AR13 | Lost Creek | Lost creek | MOF | RD | 12 km | $ 15,000 | 1 | Safety |
| RNE | DAR | AR13 | Lost Creek | Stag Leap | MOF | RD | 7 km | $ 12,000 | 1 | Environment |
| RNE | DAR | AR13 | Lost Creek | Lead Ceek | MOF | RD | 5 km | $ 7,000 | 1 | Environment |
| RNE | DAR | AR11 | Hidden Creek | Hidden Creek | MOF | RD | 9 km | $ 9,000 | 1 | Environment |
| RNE | DAR | AR11 | Hidden Creek | Porcupine creek | MOF | RD | 15 km | $ 10,000 | 1 | Environment |
| RNE | DAR | AR11 | Hidden Creek | Sheep Creek | MOF | RD | 30 km | $ 20,000 | 1 | Environment |
| DAR Sub total | | | | | | | | $ 93,000 | | |
| RNE | DKL | KL_15 | Lost Ledge | Lost Ledge | MoF | RD | 67 | $ 70,000 | 1 | Infrastructure-Highway |
| RNE | DKL | KL_19 | Crawford Creek | Crawford Creek | MoF | RD | 34 | $ 36,000 | 1 | Infrastructure-Maintained Road |
| RNE | DKL | KL_19 | Crawford Creek | Crawford Creek | MoF | RR | 6 | $ 36,000 | 1 | Maintained Road, Safety |
| RNE | DKL | KL_23 | East Shore | LaFrance | MoF | RD | 13 | $ 15,000 | 1 | Access |
| RNE | DKL | KL_23 | East Shore | LaFrance | MoF | RR | 3 | $ 18,000 | 1 | EEV Proposal, Safety-Landslides |
| RNE | DKL | KL_23 | East Shore | LaFrance | MoF | HR | 4 | $ 20,000 | 1 | Access, Safety, Water Quality |
| RNE | DKL | KL_18 | Coffee Creek | Coffee Creek | MCC | RD | 46 | $ 48,000 | 1 | EEV Proposal, Safety-Landslides |
| RNE | DKL | KL_18 | Coffee Creek | Coffee Creek | MCC | RR | 5 | $ 30,000 | 1 | EEV Proposal, Safety-Landslides |
| RNE | DKL | KL_18 | Coffee Creek | Coffee Creek | MCC | HR | 3 | $ 15,000 | 1 | EEV Proposal, Plantation, Water |
| RNE | DKL | KL_23 | Akokli Creek | Akokli Creek | MoF | RD | 29 | $ 31,000 | 1 | Infrastructure, Water Use |
| RNE | DKL | KL_20 | Redfish Creek | Redfish Creek | MoF | RD | 7 | $ 9,000 | 1 | Infrastructure, Park Access |
| RNE | DKL | KL_19, KL_21 | East Shore | Gray Creek | CTWB | RD | | $ - | 1 | EEV, Transportation Corridor |
| RNE | DKL | KL_19, KL_21 | East Shore | Gray Creek | CTWB | RR | | $ - | 1 | EEV, Transportation Corridor |
| RNE | DKL | KL_32 | Boundary | Monk Creek | JHH | RD | | $ - | 1 | EEV Proposal, Powerline, Rec. |
| RNE | DKL | KOTL_04000004 | Kaslo River | Keen Creek | SFP | RD | 15 | $ 17,000 | 1 | Infrastructure, Park Access |
| RNE | DKL | KOTL_04000004 | Kaslo River | Keen Creek | SFP | RR | 3 | $ 18,000 | 1 | Infrastructure, Park Access |
| RNE | DKL | KL_22 | Sitkum Creek | Sitkum Creek | SFP | RD | 4 | $ 6,000 | 1 | Infrastructure, Water Use |
| RNE | DKL | KL_32 | Boundary | Dodge Creek | JHH | RD | 21 | $ 23,000 | 1 | Infrastructure, Water Use |
| DKB Sub total | | | | | | | | $ 392,000 | | |
| Total | | | | | | | | $ 865,000 | | |

APPENDIX 10

# RESOURCE MANAGEMENT PLAN - ENGINEERING PROGRAM

**FOR YEAR 2001/02** **REGION Nelson**

| ACTIVITY | ACCOUNT | PRIORITY | OUTPUT UNITS | OUTPUT GOALS | ESTIMATED COSTS | | | | TOTAL EST. $ | BUDGET ALLOC. | ACTUAL COSTS | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | BASE $ | CUMUL. BASE $ | INCR. $ | CUMUL. INCR. $ | | | | |
| **Fixed Costs (region $):** | | | | | | | | | | | | |
| Right-of-way acquisition | 40802 | H | NO. | 2 | 32,500 | 32500 | 0 | 32500 | 32500 | | | |
| emergency repairs | 40803 | H | NO. | | 150,000 | 182500 | 0 | 150000 | 150000 | | | |
| inspection of bridges/major culverts | 40804 | H | NO. | 467 | 90,000 | 272500 | 0 | 90000 | 90000 | | | |
| railway crossing maint. | 40805 | H | NO. | 5 | 10,000 | 282500 | 0 | 10000 | 10000 | | | |
| subtotal | | | | | 282500 | | 0 | | 282500 | | | |
| **Surface Maintenance +** | 40805 | H | KM | 763 | 617,721 | 900221 | 0 | 10000 | 617721 | | | |
| **Non Modification Repairs** | | M | KM | 882 | 0 | 900221 | 416,475 | 426475 | 416475 | | | |
| (e.g., grading, brushing, cross drain culvert repairs, ditch cleanout, bridge deck cleaning and repair, road surfacing) | | L | KM | 216 | 0 | 900221 | 111,650 | 538125 | 111650 | | | |
| subtotal | | | | | 617721 | | 528125 | | 1145846 | | | |
| **Modification-Bridge and** | 40806 | H | NO. | 31 | 2,130,000 | 3030221 | 0 | 538125 | 2130000 | | | |
| **Major Culvert Replacement** | or | M | NO. | 24 | 0 | 3030221 | 1,435,000 | 1973125 | 1435000 | | | |
| (needs road layout and design) | 40812 | L | NO. | 1 | 0 | 3030221 | 50,000 | 2023125 | 50000 | | | |
| subtotal | | | | | 2130000 | | 1485000 | | 3615000 | | | |
| **Modification-Other Works** | 40807 | H | NO. | 101 | 365,000 | 3395221 | 0 | 2023125 | 365000 | | | |
| (needs road layout and design) | | M | NO. | 61 | 0 | 3395221 | 189,000 | 2212125 | 189000 | | | |
| (e.g., road relocation, stream culvert replacement, road stability repair) | | L | NO. | 81 | 0 | 3395221 | 124,000 | 2336125 | 124000 | | | |
| subtotal | | | | | 365000 | | 313000 | | 678000 | | | |
| **Road Deactivation** | 40808 | H | KM | 154 | 243,000 | 3638221 | 0 | 2336125 | 243000 | | | |
| | | M | KM | 168 | 0 | 3638221 | 365,000 | 2701125 | 365000 | | | |
| | | L | KM | 196 | 0 | 3638221 | 152,000 | 2853125 | 152000 | | | |
| subtotal | | | | | 243000 | | 517000 | | 760000 | | | |
| TOTAL | | | | | 3638221 | | 2843125 | | 6481346 | | | |

g:/workgroup/engineerkwh/nelson-2001/02rmp.summary

APPENDIX 10

# RESOURCE MANAGEMENT PLAN - ENGINEERING PROGRAM

**FOR YEAR 2002/03** **REGION Nelson**

| ACTIVITY | ACCOUNT | PRIORITY | OUTPUT UNITS | OUTPUT GOALS | ESTIMATED COSTS | | | | TOTAL EST. $ | BUDGET ALLOC. | ACTUAL COSTS | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | BASE $ | CUMUL. BASE $ | INCR. $ | CUMUL. INCR. $ | | | | |
| **Fixed Costs (region $):** | | | | | | | | | | | | |
| Right-of-way acquisition | *40802* | H | NO. | | 50,000 | 50000 | 0 | 50000 | 50000 | | | |
| emergency repairs | *40803* | H | NO. | | 150,000 | 200000 | 0 | 150000 | 150000 | | | |
| inspection of bridges/major culverts | *40804* | H | NO. | | 50,000 | 250000 | 0 | 50000 | 50000 | | | |
| railway crossing maint. | *40805* | H | NO. | | 10,000 | 260000 | 0 | 10000 | 10000 | | | |
| subtotal | | | | | 260000 | | 0 | | 260000 | | | |
| **Surface Maintenance +** | *40805* | H | KM | | 884,120 | 1144120 | 0 | 10000 | 884120 | | | |
| **Non Modification Repairs** | | M | KM | | 0 | 1144120 | | 10000 | 0 | | | |
| (e.g., grading, brushing, cross drain culvert repairs, ditch cleanout, bridge deck cleaning and repair, road surfacing) | | L | KM | | 0 | 1144120 | | 10000 | 0 | | | |
| subtotal | | | | | 884120 | | 0 | | 884120 | | | |
| **Modification-Bridge and** | *40806* | H | NO. | | 2,013,000 | 3157120 | 0 | 10000 | 2013000 | | | |
| **Major Culvert Replacement** | *or* | M | NO. | | 0 | 3157120 | | 10000 | 0 | | | |
| (needs road layout and design) | *40812* | L | NO. | | 0 | 3157120 | | 10000 | 0 | | | |
| subtotal | | | | | 2013000 | | 0 | | 2013000 | | | |
| **Modification-Other Works** | *40807* | H | NO. | | 445,700 | 3602820 | 0 | 10000 | 445700 | | | |
| (needs road layout and design) | | M | NO. | | 0 | 3602820 | | 10000 | 0 | | | |
| (e.g., road relocation, stream culvert replacement, road stability repair) | | L | NO. | | 0 | 3602820 | | 10000 | 0 | | | |
| subtotal | | | | | 445700 | | 0 | | 445700 | | | |
| **Road Deactivation** | *40808* | H | KM | | 556,900 | 4159720 | 0 | 10000 | 556900 | | | |
| | | M | KM | | 0 | 4159720 | | 10000 | 0 | | | |
| | | L | KM | | 0 | 4159720 | | 10000 | 0 | | | |
| subtotal | | | | | 556900 | | 0 | | 556900 | | | |
| TOTAL | | | | | 4159720 | | 0 | | 4159720 | | | |

g:/workgroup/engineerkwh/nelson-2002/03rmp.summary

APPENDIX 10

# RESOURCE MANAGEMENT PLAN - ENGINEERING PROGRAM

**FOR YEAR 2003/04** **REGION Nelson**

| ACTIVITY | ACCOUNT | PRIORITY | OUTPUT UNITS | OUTPUT GOALS | ESTIMATED COSTS | | | | TOTAL EST. $ | BUDGET ALLOC. | ACTUAL COSTS | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | BASE $ | CUMUL. BASE $ | INCR. $ | CUMUL. INCR. $ | | | | |
| **Fixed Costs (region $):** | | | | | | | | | | | | |
| Right-of-way acquisition | *40802* | H | NO. | | 50,000 | 50000 | 0 | 50000 | 50000 | | | |
| emergency repairs | *40803* | H | NO. | | 150,000 | 200000 | 0 | 150000 | 150000 | | | |
| inspection of bridges/major culverts | *40804* | H | NO. | | 90,000 | 290000 | 0 | 90000 | 90000 | | | |
| railway crossing maint. | *40805* | H | NO. | | 10,000 | 300000 | 0 | 10000 | 10000 | | | |
| subtotal | | | | | 300000 | | 0 | | 300000 | | | |
| **Surface Maintenance +** | *40805* | H | KM | | 727,400 | 1027400 | 0 | 10000 | 727400 | | | |
| **Non Modification Repairs** | | M | KM | | 0 | 1027400 | | 10000 | 0 | | | |
| (e.g., grading, brushing, cross drain culvert repairs, ditch cleanout, bridge deck cleaning and repair, road surfacing) | | L | KM | | 0 | 1027400 | | 10000 | 0 | | | |
| subtotal | | | | | 727400 | | 0 | | 727400 | | | |
| **Modification-Bridge and** | *40806* | H | NO. | | 2,134,420 | 3161820 | 0 | 10000 | 2134420 | | | |
| **Major Culvert Replacement** | *or* | M | NO. | | 0 | 3161820 | | 10000 | 0 | | | |
| (needs road layout and design) | *40812* | L | NO. | | 0 | 3161820 | | 10000 | 0 | | | |
| subtotal | | | | | 2134420 | | 0 | | 2134420 | | | |
| **Modification-Other Works** | *40807* | H | NO. | | 257,500 | 3419320 | 0 | 10000 | 257500 | | | |
| (needs road layout and design) | | M | NO. | | 0 | 3419320 | | 10000 | 0 | | | |
| (e.g., road relocation, stream culvert replacement, road stability repair) | | L | NO. | | 0 | 3419320 | | 10000 | 0 | | | |
| subtotal | | | | | 257500 | | 0 | | 257500 | | | |
| **Road Deactivation** | *40808* | H | KM | | 429,900 | 3849220 | 0 | 10000 | 429900 | | | |
| | | M | KM | | 0 | 3849220 | | 10000 | 0 | | | |
| | | L | KM | | 0 | 3849220 | | 10000 | 0 | | | |
| subtotal | | | | | 429900 | | 0 | | 429900 | | | |
| TOTAL | | | | | 3849220 | | 0 | | 3849220 | | | |

g:/workgroup/engineer/kwh/nelson-2003/04rmp.summary

## Table 2: Inventory Status and Need by Business Driver

Region: **Nelson** District: **Cranbrook**

| | | | Business Driver | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | International | | | National | | | Strategic | | | | Regional/Sub-Regional | | | Local | | | | | | | Operational Planning Regulations | | | | | |
| **Inventory** | **Type (Intensity)** | **Status** | Convention on Biological Diversity | Kyoto Protocol | Criteria + Indicators | National Forest Strategy | Canadian Biodiversity Strategy | National Forest Inventory | Land Use Charter (CORE) | Protected Areas Strategy Process | First Nations Treaty Negotiations | Identified Wildlife Management Strategy | Regional Land Use Planning | LRMP | Timber Supply Review on TSA's | Resource Management Zones | Landscape Units | Watershed Assessments | Riparian Assessments | Sensitive Areas | Recreation Features, Sites | Ungulate Winter Ranges | Forest Development Plans | Silviculture Prescriptions | Range Use Plans | Stand Management Prescriptions | Road Design Regulations | Harvesting Regulations |
| Archaeology | AOA | B | | | | | | | | | M | | M | | L | M | M | | | L | M | | H | M | | | M | |
| | AIS | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forest Health | forest health assessment | B | | | | | | | | | | M | M | H | H | H | M | | M | M | H | M | H | M | | H | | |
| | pest incidence surveys | C | | | | | | | | | | H | M | M | M | | | | | | H | | H | M | | H | | |
| Karst | reconnaisance | n/d | | | | | | | | H | | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | planning | n/d | | | | | | | | L | | | L | L | L | L | L | | | L | L | | | | | | | |
| Range | range ecosystem inventory | C | | | | | | | L | M | | H | M | M | L | M | H | | M | M | | M | L | M/H | H | M/H | M | M |
| | range cultural inventory | B | | | | | | | | | L | | | | | | L | | | L | | | M | | M | | | |
| Recreation | visual landscape inventory | | | | | | | | | | | | H | H | H | H | H | | | H | H | | H | H | | | H | H |
| | recreation opportunity | | | | | | | | | L | L | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | recreation features | | | | | | | | | M | M | | M | M | M | M | M | | | M | M | | M | M | | | M | M |
| Terrain (Stability) Mapping (including Soils) | Level E/D/C reconnaisance | B | | | | | | | | M | | | M | M | H | | | M | M | M | L | | H | M | | | L | L |
| | Level C/B/A - detailed | C | | | | | | | | L | | | L | M | M | | | H | H | M | M | | H | H | | | M | M |
| | TS Field Assessment | A | | | | | | | | | | | | | | | | M | H | | M | | H | H | | | H | H |
| Traditional Use | TU sites | C | | | | | | | | M | H | | M | | M | L | M | | | | M | | M | M | | | | |
| Vegetation Resources Inventory (VRI) | depletion update | A | | | | | | | | | | | H | H | H | | | | | | | | | | | | | |
| | retrofit to VRI standards | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | new photo estimation | B | | | | | | | | | | | L | L | L | | | | | | | | | | | | | |
| | ground sampling (timber) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | ground sampling (full VRI) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Growth and Yield | productivity assessment | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | growth model | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Ecoregion Mapping | ecoregion interpretations | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Broad Ecosystem Inventory | BEI | n/a | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Predictive Ecosystem Mapping* | PEM - Level 1 (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | PEM - Level 2 (detailed) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Terrestrial Ecosystem Mapping* | TEM - Level R (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | TEM - Level 5 (reconnaissance) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| | TEM - Level 4 (intensive) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Rare Ecosystem Inventory | REI | C | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BCF: Fish and Fish Habitat | summary (FISS) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | overview (1:50,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | reconnaisance (1:20,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Intensive (1:5,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species / population inv | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | lake classification | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Quality/Quantity | water quantity inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water use inventory (comm w/s) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water quality inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wildlife and Wildlife Habitat | BEI interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | TEM/PEM interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species presence | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species relative abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species absolute abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | rare & endangered species | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Forest Health/Range** | **Noxious Weeds** | | | | | | | | M | M | | M | H | | | H | H | M | M | H | H | H | M | M | H | M/H | H | H |

*Terrestrial Ecosystem Mapping has an alternative, Predictive with a lower level of intensity of Ecosystem Mapping (PEM) ground truthing. All have RIC standards

**Legend:**

A = Good status
B = Satisfactory status
C = Poor Status
n/d = not done
n/a = not applicable

H = Inventory is of high improtance to the Business Driver
M = Inventory is of moderate importance to the Business Driver
L = Inventory is of low importance to the Business Driver

| | |
|---|---|
| ☐ | Explicitly required by legislation / regulation |
| ☐ | Implicitly required by legislation / regulation (interpretation involved) |
| ▨ | Needed to set management objectives or for resource management |
| ☐ | All or portion of inventory required for planning process |
| ☐ | Information not currently required |

DRAFT May 15, 2000

## Table 2: Inventory Status and Need by Business Driver

Region: **Nelson** District: **Invermere**

Business Driver

| Inventory | Type (Intensity) | Status | International | | | National | | | Strategic | | | | Regional/Sub-Regional | | | Local | | | | | | | Operational Planning Regulations | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Convention on Biological Diversity | Kyoto Protocol | Criteria + Indicators | National Forest Strategy | Canadian Biodiversity Strategy | National Forest Inventory | Land Use Charter (CORE) | Protected Areas Strategy Process | First Nations Treaty Negotiations | Identified Wildlife Management Strategy | Regional Land Use Planning | LRMP | Timber Supply Review on TSA's | Resource Management Zones | Landscape Units | Watershed Assessments | Riparian Assessments | Sensitive Areas | Recreation Features, Sites | Ungulate Winter Ranges | Forest Development Plans | Silviculture Prescriptions | Range Use Plans | Stand Management Prescriptions | Road Design Regulations | Harvesting Regulations |
| Archaeology | AOA | B | | | | | | | | | M | | M | | L | M | M | | | | | | H | M | | | | |
| | AIS | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forest Health | forest health assessment | B | | | | | | | | | | M | M | H | H | H | | | | | H | | H | M | | H | | |
| | pest incidence surveys | C | | | | | | | | | | H | M | M | M | | | | | | H | | H | M | | H | | |
| Karst | reconnaisance | n/d | | | | | | | | H | | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | planning | n/d | | | | | | | | L | | | L | L | L | L | L | | | L | L | | | | | | | |
| Range | range ecosystem inventory | C | | | | | | | L | M | | H | M | M | L | | H | | M | M | | M | L | | H | | | |
| | range cultural inventory | B | | | | | | | | | L | | | | | | L | | | L | | | M | | M | | | |
| Recreation | visual landscape inventory | | | | | | | | | | | | H | H | H | H | H | | | H | H | | H | H | | | H | H |
| | recreation opportunity | | | | | | | | | L | L | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | recreation features | | | | | | | | | M | M | | M | M | M | M | M | | | M | M | | M | M | | | M | M |
| Terrain (Stability) Mapping (including Soils) | Level E/D/C reconnaisance | B | | | | | | | | M | | | M | M | H | | | M | M | M | L | | M | M | | | L | L |
| | Level C/B/A - detailed | C | | | | | | | | L | | | L | M | M | | | H | H | M | M | | H | H | | | M | M |
| | TS Field Assessment | A | | | | | | | | | | | | | | | | M | H | | M | | H | H | | | H | H |
| Traditional Use | TU sites | C | | | | | | | | M | H | | M | | M | L | M | | | | M | | M | M | | | | |
| Vegetation Resources Inventory (VRI) | depletion update | B | | | | | | | | | | | H | H | H | | | | | | | | | | | | | |
| | retrofit to VRI standards | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | new photo estimation | B | | | | | | | | | | | L | L | L | | | | | | | | | | | | | |
| | ground sampling (timber) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | ground sampling (full VRI) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Growth and Yield | productivity assessment | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | growth model | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Ecoregion Mapping | ecoregion interpretations | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Broad Ecosystem Inventory | BEI | n/a | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Predictive Ecosystem Mapping* | PEM - Level 1 (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | PEM - Level 2 (detailed) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Terrestrial Ecosystem Mapping* | TEM - Level R (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | TEM - Level 5 (reconnaissance) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| | TEM - Level 4 (intensive) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Rare Ecosystem Inventory | REI | C | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BCF: Fish and Fish Habitat | summary (FISS) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | overview (1:50,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | reconnaisance (1:20,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Intensive (1:5,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species / population inv | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | lake classification | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Quality/Quantity | water quantity inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water use inventory (comm w/s) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water quality inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wildlife and Wildlife Habitat | BEI interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | TEM/PEM interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species presence | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species relative abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species absolute abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | rare & endangered species | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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DRAFT May 15, 2000

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## Table 2: Inventory Status and Need by Business Driver

Region: **Nelson** District: **Columbia - Golden TSA**

| | | | Business Driver: International | | | National | | | Strategic | | | | Regional/Sub-Regional | | | Local | | | | | | | Operational Planning Regulations | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inventory** | **Type (Intensity)** | **Status** | Convention on Biological Diversity | Kyoto Protocol | Criteria + Indicators | National Forest Strategy | Canadian Biodiversity Strategy | National Forest Inventory | Land Use Charter (CORE) | Protected Areas Strategy Process | First Nations Treaty Negotiations | Identified Wildlife Management Strategy | Regional Land Use Planning | LRMP | Timber Supply Review on TSA's | Resource Management Zones | Landscape Units | Watershed Assessments | Riparian Assessments | Sensitive Areas | Recreation Features, Sites | Ungulate Winter Ranges | Forest Development Plans | Silviculture Prescriptions | Range Use Plans | Stand Management Prescriptions | Road Design Regulations | Harvesting Regulations |
| Archaeology | AOA | B | | | | | | | | | M | | M | | L | M | M | | | | | | H | M | | | | |
| | AIS | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forest Health | forest health assessment | B | | | | | | | | | | M | M | H | H | H | | | | | H | | H | M | | H | | |
| | pest incidence surveys | C | | | | | | | | | | H | M | M | M | | | | | | H | | H | M | | H | | |
| Karst | reconnaisance | n/d | | | | | | | | H | | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | planning | n/d | | | | | | | | L | | | L | L | L | L | L | | | L | L | | | | | | | |
| Range | range ecosystem inventory | C | | | | | | | L | M | | H | M | M | L | | H | | M | M | | M | L | | H | | | |
| | range cultural inventory | B | | | | | | | | | L | | | | | | L | | | L | | | M | | M | | | |
| Recreation | visual landscape inventory | | | | | | | | | | | | H | H | H | H | H | | | H | H | | H | H | | | H | H |
| | recreation opportunity | | | | | | | | | L | L | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | recreation features | | | | | | | | | M | M | | M | M | M | M | M | | | M | M | | M | M | | | M | M |
| Terrain (Stability) Mapping (including Soils) | Level E/D/C reconnaisance | B | | | | | | | | M | | | M | M | H | | | M | M | M | L | | H | M | | | L | L |
| | Level C/B/A - detailed | C | | | | | | | | L | | | L | M | M | | | H | H | M | M | | H | H | | | M | M |
| | TS Field Assessment | A | | | | | | | | | | | | | | | | M | H | | M | | H | H | | | H | H |
| Traditional Use | TU sites | C | | | | | | | | M | H | | M | | M | L | M | | | | M | | M | M | | | | |
| Vegetation Resources Inventory (VRI) | depletion update | C | | | | | | | | | | | H | H | H | | | | | | | | | | | | | |
| | retrofit to VRI standards | n/a | | | | | | | | | | | L | L | L | | | | | | | | | | | | | |
| | new photo estimation | A | | | | | | | | | | | L | L | L | | | | | | | | | | | | | |
| | ground sampling (timber) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | ground sampling (full VRI) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Growth and Yield | productivity assessment | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | growth model | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Ecoregion Mapping | ecoregion interpretations | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Broad Ecosystem Inventory | BEI | n/a | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Predictive Ecosystem Mapping* | PEM - Level 1 (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | PEM - Level 2 (detailed) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
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| | TEM - Level 5 (reconnaissance) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| | TEM - Level 4 (intensive) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Rare Ecosystem Inventory | REI | C | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BCF: Fish and Fish Habitat | summary (FISS) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | overview (1:50,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | reconnaisance (1:20,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Intensive (1:5,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species / population inv | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | lake classification | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Quality/Quantity | water quantity inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water use inventory (comm w/s) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water quality inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wildlife and Wildlife Habitat | BEI interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | TEM/PEM interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species presence | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species relative abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species absolute abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | rare & endangered species | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Table 2: Inventory Status and Need by Business Driver

Region: **Nelson** District: **Columbia - Revelstoke TSA**

| | | | Business Driver | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | International | | | National | | | Strategic | | | | Regional/Sub-Regional | | | Local | | | | | | | Operational Planning Regulations | | | | | |
| **Inventory** | **Type (Intensity)** | **Status** | Convention on Biological Diversity | Kyoto Protocol | Criteria + Indicators | National Forest Strategy | Canadian Biodiversity Strategy | National Forest Inventory | Land Use Charter (CORE) | Protected Areas Strategy Process | First Nations Treaty Negotiations | Identified Wildlife Management Strategy | Regional Land Use Planning | LRMP | Timber Supply Review on TSA's | Resource Management Zones | Landscape Units | Watershed Assessments | Riparian Assessments | Sensitive Areas | Recreation Features Sites | Ungulate Winter Ranges | Forest Development Plans | Silviculture Prescritpions | Range Use Plans | Stand Management Prescriptions | Road Design Regulations | Harvesting Regulations |
| Archaeology | AOA | B | | | | | | | | | M | | M | | L | M | M | | | | | | H | M | | | | |
| | AIS | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forest Health | forest health assessment | B | | | | | | | | | | M | M | H | H | H | | | | | H | | H | M | | H | | |
| | pest incidence surveys | C | | | | | | | | | | H | M | M | M | | | | | | H | | H | M | | H | | |
| Karst | reconnaisance | n/d | | | | | | | | H | | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | planning | n/d | | | | | | | | L | | | L | L | L | L | L | | | L | L | | | | | | | |
| Range | range ecosystem inventory | C | | | | | | | L | M | | H | M | M | L | | H | | M | M | | M | L | | H | | | |
| | range cultural inventory | B | | | | | | | | | L | | | | | | L | | | L | | | M | | M | | | |
| Recreation | visual landscape inventory | | | | | | | | | | | | H | H | H | H | H | | | H | H | | H | H | | | H | H |
| | recreation opportunity | | | | | | | | | L | L | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | recreation features | | | | | | | | | M | M | | M | M | M | M | M | | | M | M | | M | M | | | M | M |
| Terrain (Stability) Mapping (including Soils) | Level E/D/C reconnaisance | B | | | | | | | | M | | | M | M | H | | | M | M | M | L | | H | M | | | L | L |
| | Level C/B/A - detailed | C | | | | | | | | L | | | L | M | M | | | H | H | M | M | | H | H | | | M | M |
| | TS Field Assessment | A | | | | | | | | | | | | | | | | M | H | | M | | H | H | | | H | H |
| Traditional Use | TU sites | C | | | | | | | | M | H | | M | | M | L | M | | | | M | | M | M | | | | |
| Vegetation Resources Inventory (VRI) | depletion update | B | | | | | | | | | | | H | H | H | H | H | H | | | | H | H | | L | H | | |
| | retrofit to VRI standards | n/d | | | | | | | | | | | M | M | H | | H | | | | | | | | | | | |
| | new photo estimation | B | | | | | | | | | | | L | L | L | H | | | | | | | H | | | M | | |
| | ground sampling (timber) | n/d | | | | | | | | | | | M | M | H | H | H | | | | | | H | | | M | | |
| | ground sampling (full VRI) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | L | | | |
| Growth and Yield | productivity assessment | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | growth model | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Ecoregion Mapping | ecoregion interpretations | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Broad Ecosystem Inventory | BEI | n/a | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Predictive Ecosystem Mapping* | PEM - Level 1 (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | PEM - Level 2 (detailed) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Terrestrial Ecosystem Mapping* | TEM - Level R (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | TEM - Level 5 (reconnaissance) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| | TEM - Level 4 (intensive) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Rare Ecosystem Inventory | REI | C | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BCF Fish and Fish Habitat | summary (FISS) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | overview (1:50,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | reconnaisance (1:20,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Intensive (1:5,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species / population inv | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | lake classification | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Quality/Quantity | water quantity inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water use inventory (comm w/s) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water quality inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wildlife and Wildlife Habitat | BEI interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | TEM/PEM interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species presence | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species relative abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species absolute abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | rare & endangered species | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Table 2: Inventory Status and Need by Business Driver

Region: **Nelson** District: **Arrow**

| Inventory | Type (Intensity) | Status | International | | | National | | | Strategic | | | | Regional/Sub-Regional | | | Local | | | | | | | Operational Planning Regulations | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Convention on Biological Diversity | Kyoto Protocol | Criteria + Indicators | National Forest Strategy | Canadian Biodiversity Strategy | National Forest Inventory | Land Use Charter (CORE) | Protected Areas Strategy Process | First Nations Treaty Negotiations | Identified Wildlife Management Strategy | Regional Land Use Planning | LRMP | Timber Supply Review on TSA's | Resource Management Zones | Landscape Units | Watershed Assessments | Riparian Assessments | Sensitive Areas | Recreation Features, Sites | Ungulate Winter Ranges | Forest Development Plans | Silviculture Prescritpions | Range Use Plans | Stand Management Prescriptions | Road Design Regulations | Harvesting Regulations |
| Archaeology | AOA | B | | | | | | | | | M | | M | | L | M | M | | | | | | H | M | | | | |
| | AIS | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forest Health | forest health assessment | B | | | | | | | | | | M | M | H | H | H | | | | | H | | H | M | | H | | |
| | pest incidence surveys | C | | | | | | | | | | H | M | M | M | | | | | | H | | H | M | | H | | |
| Karst | reconnaisance | n/d | | | | | | | | H | | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | planning | n/d | | | | | | | | L | | | L | L | L | L | L | | | L | L | | | | | | | |
| Range | range ecosystem inventory | C | | | | | | | L | M | | H | M | M | L | | H | | M | M | | M | L | | H | | | |
| | range cultural inventory | B | | | | | | | | | L | | | | | | L | | | L | | | M | | M | | | |
| Recreation | visual landscape inventory | | | | | | | | | | | | H | H | H | H | H | | | H | H | | H | H | | | H | H |
| | recreation opportunity | | | | | | | | | L | L | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | recreation features | | | | | | | | | M | M | | M | M | M | M | M | | | M | M | | M | M | | | M | M |
| Terrain (Stability) Mapping (including Soils) | Level E/D/C reconnaisance | B | | | | | | | | M | | | M | M | H | | | M | M | M | L | | H | M | | | L | L |
| | Level C/B/A - detailed | C | | | | | | | | L | | | L | M | M | | | H | H | M | M | | H | H | | | M | M |
| | TS Field Assessment | A | | | | | | | | | | | | | | | | M | H | | M | | H | H | | | H | H |
| Traditional Use | TU sites | C | | | | | | | | M | H | | M | | M | L | M | | | | M | | M | M | | | | |
| Vegetation Resources Inventory (VRI) | depletion update | B | | | | | | | | | | | H | H | H | | | | | | | | | | | | | |
| | retrofit to VRI standards | n/d | | | | | | | | | | | M | M | M | | | | | | | | | | | | | |
| | new photo estimation | C | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | ground sampling (timber) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | ground sampling (full VRI) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Growth and Yield | productivity assessment | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | growth model | B | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Ecoregion Mapping | ecoregion interpretations | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Broad Ecosystem Inventory | BEI | n/a | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Predictive Ecosystem Mapping* | PEM - Level 1 (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
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| | overview (1:50,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | reconnaisance (1:20,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Intensive (1:5,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species / population inv | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | lake classification | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Quality/Quantity | water quantity inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water use inventory (comm.w/s) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water quality inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wildlife and Wildlife Habitat | BEI interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | TEM/PEM interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species presence | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species relative abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species absolute abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | rare & endangered species | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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All or portion of inventory required for planning process
Information not currently required

## Table 2: Inventory Status and Need by Business Driver

Region: **Nelson** District: **Boundary**

| | | | Business Driver: International | | | National | | | Strategic | | | | Regional/Sub-Regional | | | Local | | | | | | | Operational Planning Regulations | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inventory** | **Type (Intensity)** | **Status** | Convention on Biological Diversity | Kyoto Protocol | Criteria + Indicators | National Forest Strategy | Canadian Biodiversity Strategy | National Forest Inventory | Land Use Charter (CORE) | Protected Areas Strategy Process | First Nations Treaty Negotiations | Identified Wildlife Management Strategy | Regional Land Use Planning | LRMP | Timber Supply Review on TSA's | Resource Management Zones | Landscape Units | Watershed Assessments | Riparian Assessments | Sensitive Areas | Recreation Features, Sites | Ungulate Winter Ranges | Forest Development Plans | Silviculture Prescriptions | Range Use Plans | Stand Management Prescriptions | Road Design Regulations | Harvesting Regulations |
| Archaeology | AOA | B | | | | | | | | | M | | M | | L | M | M | M | M | | H | L | H | H | L | M | H | H |
| | AIS | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Forest Health | forest health assessment | B | | | | | | | | | | M | M | H | H | H | | | | | H | | H | M | | H | | |
| | pest incidence surveys | C | | | | | | | | | | H | M | M | M | | | | | | H | | H | M | | H | | |
| Karst | reconnaisance | n/d | | | | | | | | H | | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | planning | n/d | | | | | | | | L | | | L | L | L | L | L | | | L | L | | | | | | | |
| Range | range ecosystem inventory | C | | | | | | | L | M | | H | M | M | L | | H | | M | M | | M | L | | H | | | |
| | range cultural inventory | B | | | | | | | | | L | | | | | | L | | | L | | | M | | M | | | |
| Recreation | visual landscape inventory | | | | | | | | | | | | H | H | H | H | H | | | H | H | | H | H | | | H | H |
| | recreation opportunity | | | | | | | | | L | L | | L | L | L | L | L | | | L | L | | L | L | | | L | L |
| | recreation features | | | | | | | | | M | M | | M | M | M | M | M | | | M | M | | M | M | | | M | M |
| Terrain (Stability) Mapping (including Soils) | Level E/D/C reconnaisance | B | | | | | | | | M | | | M | M | H | L | L | H | M | M | L | L | H | H | | | H | H |
| | Level C/B/A - detailed | C | | | | | | | | L | | | L | M | M | L | L | H | H | M | M | L | H | H | | | H | H |
| | TS Field Assessment | A | | | | | | | | | | | | | | L | L | H | H | M | M | L | H | H | | | H | H |
| Traditional Use | TU sites | C | | | | | | | | M | H | | M | | M | L | M | | | | M | | M | M | | | | |
| Vegetation Resources Inventory (VRI) | depletion update | B | | | | | | | | | | | H | H | H | | | | | | | | | | | | | |
| | retrofit to VRI standards | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | new photo estimation | B | | | | | | | | | | | L | L | L | | | | | | | | | | | | | |
| | ground sampling (timber) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| | ground sampling (full VRI) | n/d | | | | | | | | | | | M | M | H | | | | | | | | | | | | | |
| Growth and Yield | productivity assessment | B | | | | | | | | | | | M | M | H | | | | | | | | | | | M | | |
| | growth model | B | | | | | | | | | | | M | M | H | | | | | | | | | | | H | | |
| Ecoregion Mapping | ecoregion interpretations | n/d | | | | | | | | | | | | | | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Broad Ecosystem Inventory | BEI | n/a | | | | | | | | | | | | | | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Predictive Ecosystem Mapping* | PEM - Level 1 (overview) | C | | | | | | | | M | | M | | M | | L | L | L | L | L | L | L | L | L | L | L | L | L |
| | PEM - Level 2 (detailed) | C | | | | | | | | M | | M | | M | | L | L | L | L | L | L | M | M | M | | M | | |
| Terrestrial Ecosystem Mapping* | TEM - Level R (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | TEM - Level 5 (reconnaissance) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| | TEM - Level 4 (intensive) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Rare Ecosystem Inventory | REI | C | | | | | | | | | | | | | | | H | | | H | | H | H | H | H | H | H | H |
| BCF: Fish and Fish Habitat | summary (FISS) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | overview (1:50,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | reconnaisance (1:20,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Intensive (1:5,000) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species / population inv | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | lake classification | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Quality/Quantity | water quantity inventory | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | water use inventory (comm w/s) | B | | | | | | | | | | | | | | | | H | | | M | | H | H | | M | H | H |
| | water quality inventory | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wildlife and Wildlife Habitat | BEI interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | TEM/PEM interpretations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species presence | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species relative abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | species absolute abundance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | rare & endangered species | | | | | | | | | | | | | | | | | | | | | | | | | | | |

*Terrestrial Ecosystem Mapping has an alternative, Predictive with a lower level of intensity of Ecosystem Mapping (PEM) ground truthing. All have RIC standards

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**Legend:**

A = Good status
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Information not currently required

# Table 2: Inventory Status and Need by Business Driver

Region: **Nelson** District: **Kootenay Lake**

| Inventory | Type (intensity) | Status | Business Driver: International | | | National | | | Strategic | | | | Regional/Sub-Regional | | | Local | | | | | | | Operational Planning Regulations | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Convention on Biological Diversity | Kyoto Protocol | Criteria + Indicators | National Forest Strategy | Canadian Biodiversity Strategy | National Forest Inventory | Land Use Charter (CORE) | Protected Areas Strategy Process | First Nations Treaty Negotiations | Identified Wildlife Management Strategy | Regional Land Use Planning | LRMP | Timber Supply Review on TSA's | Resource Management Zones | Landscape Units | Watershed Assessments | Riparian Assessments | Sensitive Areas | Recreation Features Sites | Ungulate Winter Ranges | Forest Development Plans | Silviculture Prescritpions | Range Use Plans | Stand Management Prescriptions | Road Design Regulations | Harvesting Regulations |
| Archaeology | AOA | B | | | | | | | M | M | M | L | M | M | L | M | M | | | M | M | | H | M | M | M | | |
| | AIS | n/d | | | | | | | L | | | | | | | | | | | M | M | | M | M | L | L | M | M |
| Forest Health | forest health assessment | B | | | | | | | M | | | M | M | H | H | H | H | M | M | M | H | M | H | M | M | H | | |
| | pest incidence surveys | C | | | | | | | L | | | H | M | M | M | | | L | M | M | H | L | H | M | M | H | | |
| Karst | reconnaisance | n/d | | | | | | | M | H | | M | L | M | L | L | M | M | L | M | M | | M | M | M | L | M | M |
| | planning | n/d | | | | | | | L | L | | M | L | L | L | L | L | M | L | L | L | | L | M | L | L | L | L |
| Range | range ecosystem inventory | C | | | | | | | L | M | | H | M | M | L | | H | | M | M | | M | L | L | H | L | | |
| | range cultural inventory | B | | | | | | | L | | L | | | | | | L | | | L | | | M | | M | | | |
| Recreation | visual landscape inventory | | | | | | | | H | M | | | H | H | H | H | H | L | | H | H | L | H | H | L | L | H | H |
| | recreation opportunity | | | | | | | | M | L | L | L | L | L | L | L | L | L | | L | L | L | L | L | L | | L | L |
| | recreation features | | | | | | | | H | M | M | L | M | M | M | M | M | | | M | M | L | M | M | M | M | M | M |
| Terrain (Stability) Mapping (including Soils) | Level E/D/C reconnaisance | B | | | | | | | M | M | | | M | M | H | M | H | M | M | M | L | | H | M | | L | L | L |
| | Level C/B/A - detailed | C | | | | | | | L | L | | | L | M | H | M | H | H | H | M | M | | H | H | | M | M | M |
| | TS Field Assessment | A | | | | | | | L | L | | | | | H | L | M | M | H | M | M | | H | H | | H | H | H |
| Traditional Use | TU sites | C | | | | | | | H | H | H | M | M | H | M | M | M | | | M | M | | M | M | M | | | |
| Vegetation Resources Inventory (VRI) | depletion update | B | | | | | | | H | H | | M | H | H | H | | | | | | | | | | | | | |
| | retrofit to VRI standards | n/d | | | | | | | M | H | | M | M | M | M | | | | | | | | | | | | | |
| | new photo estimation | C | | | | | | | M | M | | M | M | M | H | | | | | | | | | | | | | |
| | ground sampling (timber) | n/d | | | | | | | M | M | | M | M | M | H | | | | | | | | | | | | | |
| | ground sampling (full VRI) | n/d | | | | | | | L | M | | M | M | M | H | | | | | | | | | | | | | |
| Growth and Yield | productivity assessment | B | | | | | | | H | H | | | M | M | H | H | H | M | | | | | | M | | | | |
| | growth model | B | | | | | | | H | H | | | H | H | H | H | H | M | | | | | | M | | | | |
| Ecoregion Mapping | ecoregion interpretations | n/d | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Broad Ecosystem Inventory | BEI | n/a | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Predictive Ecosystem Mapping* | PEM - Level 1 (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | PEM - Level 2 (detailed) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Terrestrial Ecosystem Mapping* | TEM - Level R (overview) | C | | | | | | | | M | | M | | M | | | | | | | | | | | | | | |
| | TEM - Level 5 (reconnaissance) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| | TEM - Level 4 (intensive) | C | | | | | | | | M | | M | | M | | | | | | | | M | M | M | | M | | |
| Rare Ecosystem Inventory | REI | C | | | | | | | N | H | | H | M | M | L | M | H | | | | | | L | M | M | | | |
| BCF Fish and Fish Habitat | summary (FISS) | | | | | | | | L | L | | L | L | M | L | L | M | | | | | L | M | M | M | | | |
| | overview (1:50,000) | | | | | | | | M | M | | M | M | M | M | M | H | | | | | M | H | M | M | | | |
| | reconnaisance (1:20,000) | | | | | | | | H | H | | H | L | M | H | H | H | | | | | H | M | H | M | | | |
| | Intensive (1:5,000) | | | | | | | | L | M | | H | L | L | M | M | M | | | | | H | L | H | M | | | |
| | species / population inv | | | | | | | | L | M | | H | L | L | M | M | L | | | | | H | L | H | M | | | |
| | lake classification | | | | | | | | L | L | | L | M | M | M | M | M | | | | | L | L | M | L | | | |
| Water Quality/Quantity | water quantity inventory | | | | | | | | M | L | | | M | M | L | M | M | M | | | | | M | M | | | | |
| | water use inventory (comm w/s) | | | | | | | | M | L | | | M | M | L | M | M | M | | | | | M | M | | | | |
| | water quality inventory | | | | | | | | M | L | | | M | M | L | M | M | M | | | | | M | M | | | | |
| Wildlife and Wildlife Habitat | BEI interpretations | | | | | | | | L | L | | M | L | L | L | L | M | | | | | M | L | M | L | | | |
| | TEM/PEM interpretations | | | | | | | | L | L | | M | L | L | L | L | M | | | | | M | L | M | M | | | |
| | species presence | | | | | | | | M | M | | H | M | M | L | M | H | | | | | H | M | M | M | | | |
| | species relative abundance | | | | | | | | M | M | | H | M | M | L | M | H | | | | | H | M | M | M | | | |
| | species absolute abundance | | | | | | | | M | M | | H | M | M | L | M | H | | | | | H | M | M | M | | | |
| | rare & endangered species | | | | | | | | H | H | | H | H | H | M | H | H | | | | | H | M | H | H | | | |

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## Table 2: Inventory Status and Need by Business Driver

Region: **Nelson** District:

|  |  |  | Business Driver |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | International |  |  | National |  |  | Strategic |  |  |  | Regional/Sub-Regional |  |  | Local |  |  |  |  |  |  | Operational Planning Regulations |  |  |  |  |  |
| **Inventory** | **Type (Intensity)** | **Status** | Convention on Biological Diversity | Kyoto Protocol | Criteria + Indicators | National Forest Strategy | Canadian Biodiversity Strategy | National Forest Inventory | Land Use Charter (CORE) | Protected Areas Strategy Process | First Nations Treaty Negotiations | Identified Wildlife Management Strategy | Regional Land Use Planning | LRMP | Timber Supply Review on TSA's | Resource Management Zones | Landscape Units | Watershed Assessments | Riparian Assessments | Sensitive Areas | Recreation Features Sites | Ungulate Winter Ranges | Forest Development Plans | Silviculture Prescritpions | Range Use Plans | Stand Management Prescriptions | Road Design Regulations | Harvesting Regulations |
| Archaeology | AOA | B |  |  |  |  |  |  |  |  | M |  | M |  | L | M | M |  |  |  |  |  | H | M |  |  |  |  |
|  | AIS | n/d |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Forest Health | forest health assessment | B |  |  |  |  |  |  |  |  |  | M | M | H | H | H |  |  |  |  | H |  | H | M |  | H |  |  |
|  | pest incidence surveys | C |  |  |  |  |  |  |  |  |  | H | M | M | M |  |  |  |  |  | H |  | H | M |  | H |  |  |
| Karst | reconnaisance | n/d |  |  |  |  |  |  |  | H |  |  | L | L | L | L | L |  |  | L | L |  | L | L |  |  | L | L |
|  | planning | n/d |  |  |  |  |  |  |  | L |  |  | L | L | L | L | L |  |  | L | L |  |  |  |  |  |  |  |
| Range | range ecosystem inventory | C |  |  |  |  |  |  | L | M |  | H | M | M | L |  | H |  | M | M |  | M | L |  | H |  |  |  |
|  | range cultural inventory | B |  |  |  |  |  |  |  |  | L |  |  |  |  |  | L |  |  | L |  |  | M |  | M |  |  |  |
| Recreation | visual landscape inventory |  |  |  |  |  |  |  |  |  |  |  | H | H | H | H | H |  |  | H | H |  | H | H |  |  | H | H |
|  | recreation opportunity |  |  |  |  |  |  |  |  | L | L |  | L | L | L | L | L |  |  | L | L |  | L | L |  |  | L | L |
|  | recreation features |  |  |  |  |  |  |  |  | M | M |  | M | M | M | M | M |  |  | M | M |  | M | M |  |  | M | M |
| Terrain (Stability) Mapping (including Soils) | Level E/D/C reconnaisance | B |  |  |  |  |  |  |  | M |  |  | M | M | H |  |  | M | M | M | L |  | H | M |  |  | L | L |
|  | Level C/B/A - detailed | C |  |  |  |  |  |  |  | L |  |  | L | M | M |  |  | H | H | M | M |  | H | H |  |  | M | M |
|  | TS Field Assessment | A |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | H |  | M |  | H | H |  |  | H | H |
| Traditional Use | TU sites | C |  |  |  |  |  |  |  | M | H |  | M |  | M | L | M |  |  |  | M |  | M | M |  |  |  |  |
| Vegetation Resources Inventory (VRI) | depletion update |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | retrofit to VRI standards |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | new photo estimation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ground sampling (timber) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | ground sampling (full VRI) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Growth and Yield | productivity assessment | B |  |  |  |  |  |  |  |  |  |  | M | M | H |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | growth model | B |  |  |  |  |  |  |  |  |  |  | M | M | H |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ecoregion Mapping | ecoregion interpretations | n/d |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Broad Ecosystem Inventory | BEI | n/a |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Predictive Ecosystem Mapping* | PEM - Level 1 (overview) | C |  |  |  |  |  |  |  | M |  | M |  | M |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | PEM - Level 2 (detailed) | C |  |  |  |  |  |  |  | M |  | M |  | M |  |  |  |  |  |  |  | M | M | M |  | M |  |  |
| Terrestrial Ecosystem Mapping* | TEM - Level R (overview) | C |  |  |  |  |  |  |  | M |  | M |  | M |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | TEM - Level 5 (reconnaissance) | C |  |  |  |  |  |  |  | M |  | M |  | M |  |  |  |  |  |  |  | M | M | M |  | M |  |  |
|  | TEM - Level 4 (intensive) | C |  |  |  |  |  |  |  | M |  | M |  | M |  |  |  |  |  |  |  | M | M | M |  | M |  |  |
| Rare Ecosystem Inventory | REI | C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BCF Fish and Fish Habitat | summary (FISS) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | overview (1:50,000) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | reconnaisance (1:20,000) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Intensive (1:5,000) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | species / population inv |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | lake classification |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Water Quality/Quantity | water quantity inventory |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | water use inventory (comm w/s) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | water quality inventory |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Wildlife and Wildlife Habitat | BEI interpretations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | TEM/PEM interpretations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | species presence |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | species relative abundance |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | species absolute abundance |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | rare & endangered species |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Large Scale BEC** |  | C |  |  |  |  |  |  |  | M |  |  | H |  | H |  | M |  |  |  |  | M | M | M |  | M |  |  |
| **Forest Health/Range** | **Noxious Weeds** | C |  |  |  |  |  |  | M | M |  | M | H |  |  | H | H | M | M | H | H | H | M | M | H | M/H | H | H |

*Terrestrial Ecosystem Mapping has an alternative, Predictive with a lower level of intensity of Ecosystem Mapping (PEM) ground truthing. All have RIC standards

DRAFT May 15, 2000

**Legend:**

A = Good status
B = Satisfactory status
C = Poor Status
n/d = not done
n/a = not applicable

H = Inventory is of high improtance to the Business Driver
M = Inventory is of moderate importance to the Business Driver
L = Inventory is of low importance to the Business Driver

Explicitly required by legislation / regulation
Implicitly required by legislation / regulation (interpretation involved)
Needed to set management objectives or for resource management
All or portion of inventory required for planning process
Information not currently required